HOUSEHOLD TEXTILES AND LAUNDRY WORK

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INTRODUCTION

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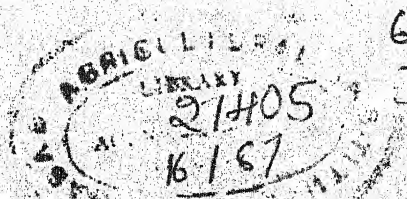

Dedicated
to
Mrs. Hilla Rustomji Faridoonji

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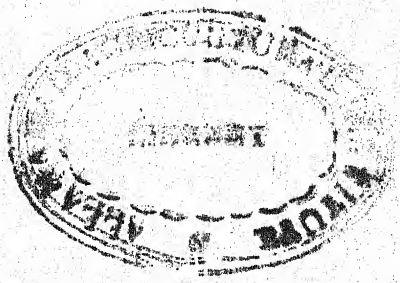
Introduction

This book on Laundry work and Textiles has come out at a very opportune time when there is a dearth of publications on the subject in this country. With the country-wide awakening to-day to the importance of Home Science or Domestic Economy in the education of girls, teachers and students feel the need of text and reference books on laundry work and cookery. The author of this book has tried to deal exhaustively on textiles, their nature and treatment. It is bound to be popular amongst all girls' schools and colleges and find a place in every library. The author is to be congratulated on her pioneer work on the subject in India.

Lady Irwin College,
New Delhi.

B. Lucas

Directress



Preface to the Third Edition

I am extremely grateful to the teachers, students and the general public for the generous reception which was accorded to the last edition of my book. Published late in 1965, the entire edition was sold out in record time. This has necessitated the publication of the Third Edition. I am sorry, due to my being extremely busy, I was not able to revise the manuscript earlier. In this third edition, the manuscript has again undergone considerable revision. Though these changes are not ordinarily conspicuous, nevertheless they are important. Besides these a new chapter *Choice and Care of Fabrics* has been added. This is a very important chapter in the present age. I am sure, this will enhance the value and usefulness of the present edition considerably.

In view of above I hope this book will become more popular than ever before.

Lady Irwin College,
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DURGA DEULKAR

Preface to the First Edition

Clothing came into existence from a very early age. The primitive people made their clothing from skins of animals and barks of trees. They also used a network of grass and strips of leaves to cover and decorate their bodies. With the progress of the human race, the textile industry developed and linen, wool, silk and cotton came into use. China, India and Egypt were probably the first countries to start the manufacture of what we call textiles to-day. They invented and manufactured many tools for spinning and weaving and not only discovered and utilised the chief textile fibres known to us *viz.* cotton, wool, silk and linen, but made remarkable progress in the technique of textile manufacture.

At first, fabrics were made entirely of one fibre. With the progress of the industry fabric manufacturers have evolved intricate and complex methods to produce a variety of quality and effects in textiles. Fabrics are made of various combinations of mixed fibres, of different kinds of yarns and different weaves. The designer and the artist too have made their contribution in bringing out new patterns. Long ago the cloth was coloured to look attractive by the use of natural dyes and pigments. The Chemist with the help of scientific research has now produced new dyes and new shades of colours and new colour combinations. He has also succeeded in introducing synthetic fibres like rayons, nylon and vynion, which when spun, woven and finished, look like natural fibres.

Changes have been so numerous and so rapid that the kaleidoscopic appearance of a cloth merchant's shop is bewildering. Every few years there are new names for weaves, colours, finishes and the new synthetics fabrics. The housewife in search of materials finds an endless variety of fabrics of different textures, colours, patterns and designs to choose from. Fashions change every now and then and this in turn provides an incentive to the manufacturer and yet many new [illegible]

production and the vast variety of the materials available, whilst providing a shopper's paradise for the housewife, make her task all the more difficult. Buying of clothes and the selection of suitable fabrics was not so difficult in the days of our grandmothers. The housewife today gets so bewildered by the greater variety that she does not find easy to judge the quality, serviceability, durability and suitability of the materials available to her. Appearances are deceptive and the mere "feel" of the fabrics is no longer a correct guide for measuring the durability or otherwise of the material. An intelligent housewife is not satisfied with the attractive appearance of the material only. She looks for other qualities too when she buys her household clothing. She wants to know the nature of the fibre, if it is serviceable, whether its colour is fast or will fade and if it will launder well, if it shrinks, and, if so, how much and most important of all, whether it is worth the money spent on it.

The durability of a material depends on the kind of fibres, the strength of the yarn, the type of the weave and the nature of the finishes used. It is essential for the housewife, therefore, to differentiate between the different kinds of fibres, strong and weak yarns and between close and loose weaves. She should be able to judge the stability of the colour and finishes. The following pages therefore are devoted to the study of the textile fibres, their chemical and physical properties, the construction of the fabrics and the various finishes that are used.

The processes and materials used in laundering the fabrics are mainly responsible for retaining the strength and serviceability of the material. She must know how the various fibres react to the different processes and reagents used in laundering. In order to take good care of the materials, a knowledge of laundering is equally essential. The section on laundry work would, therefore, be helpful to a housewife.

As has been said before, our country was one of pioneers in the manufacture of textile fabrics long before most other nations had even heard of cotton and silk materials. For centuries our people manufactured cloth which was valued and was in demand all over the then civilized world. Traditional textiles of India—like Dacca muslins, embroidered Pashmina shawls, Phulkaries, Chamba Roomals, coloured Kalamdars of

Masulipatam, Patola, Bandhani and Baluchar-Buttedar are names of fabrics for which India is justly proud. A section of the book has been devoted to a brief description of these historic patterns and fabrics, which, it is hoped, will be found interesting and informative.

I gratefully acknowledge the valuable suggestions and the great help which I have received from my colleagues and dear friends, particularly Miss M.A. Briant, Mrs Roshani Deshpande, Miss Naju Bilimoria and many others who prefer anonymity. They have one and all, worked hard and ungrudgingly in ways too numerous to mention and too highly valued to be appreciated with a too common 'thanks'.

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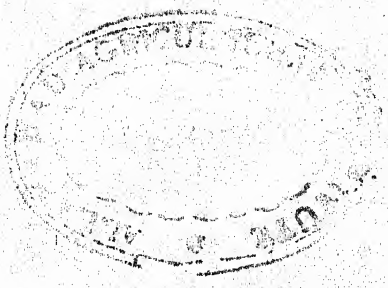
DURGA DEULKAR



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Classification of Fibres

Fibres are the basic visible units of which fabrics are made. Some fibres are short, others very long, some are kinky, scaly and rough, others are straight and smooth. They may have high or low tensile strength or are transparent, opaque, coloured or colourless, even or uneven in diameter.

Fibres may be from natural sources or man-made. Each of the natural fibres is produced in few varieties, which differ in quality, *e.g.* Egyptian cotton and Mohair are examples of good quality varieties of cotton and wool respectively.

These fibrous raw materials are divided into two classes, based on their length :

(*a*) Filament and (*b*) Staple.

(*a*) **Filaments** are natural or man-made fibres of continuous length, measurable in yards or metres. Silk and all the man-made fibres are filaments. Yarns made from filament fibres are of two types, monofilament and multifilament.

Monofilament yarns are made of a single solid, strong and smooth strand. Multi-filament yarns are composed of a number of tiny filaments twisted together. Yarns of this type contribute towards smoothness, softness, lustrous texture with good diapability.

(*b*) **Staple** fibres are short in length and measurable in inches. The length varies between three quarters of an inch to 18 inches or so. All the natural fibres except silk are staple fibres, however man-made fibres are cut into short lengths. They are also known as staple fibres.

All kinds of fibres cannot be used in the manufacture of fabrics. Only a few are suitable. The fibres that can be made into fabrics, intended for clothing or household use, must necessarily have the following properties :

The primary properties of fibres. There are five primary or essential properties staple, strength, elasticity, uniformity and spinning quality.

Staple. The word staple is associated with the dimension of the fibre, such as the length and diameter. It is an essential requirement because a fibre has to be long and fine enough for satisfactory use. Silk is a long fibre but wool and cotton are short. This disadvantage in length is compensated by the good spinning quality of both of these fibres.

Various fibres have different lengths, *e.g.*, the length of cotton varies between 0·3″ to about 2″, and wool between 1·5″ to 12 inches. All man-made fibres are made into very long filaments and they are either used as filaments or cut into shorter lengths about the same size of the other fibres, which it wants to imitate *e.g.*, certain staple rayon can look like cotton and the other like linen.

The length of the fibre, other things being equal, contributes to the strength of the yarn hence it can be generalised this way, the longer the fibre the stronger the yarn. Similar generalisation can be done in the case of fineness of staple of textile fibres. Fine filaments like silk will produce fine, smooth and uniform fabrics with better draping qualities than the coarser fibres, which can only give coarse, rough, crude and low grade fabrics.

Strength. The fibre should also be strong enough to be spun into yarn and ultimately converted into durable fabrics.

The strength of the textile fibres is very much influenced by the moisture in the atmosphere. In general, natural vegetable fibres are stronger when they are wet, while other fibres like rayon and acetate are weaker in that state.

Elasticity. Fibres must be pliable enough to wrap round each other to produce a yarn, which in turn should be able to be woven into a fabric. The fabrics should resist crushing by bearing impacts and spring back to their original state. This property makes the fabrics diapable wrinkle resistant and helps to maintain their shape and size.

Uniformity to Staple. Fibres of uniform dimensions spin better and make a smoother and uniform yarn.

Spinning Quality. In order to have good spinning quality fibres must have cohesiveness as this prevents fibre slippage. Four main factors contribute to cohesiveness between fibres in a yarn: fineness of staple, nature of surface, pressure through twisting and length of the fibres.

Besides these essential properties there are the other desirable properties such as density or specific gravity : lustre, moisture regain, flammability, felting and resistance to heat, resistance to alkalies, acids and bleaches etc.

CLASSIFICATION OF THE TEXTILE FIBRES

In the earliest stages of the textile industry, wool, silk, cotton and linen fibres were used for making fabrics, and even today these fibres are very popular and are used for most of our clothing and household articles. But in addition to these, textile industry is continually using many other fibres, which are natural, synthetic and man-made.

These may be classified into the following groups :

Natural Fibres	**Non-thermoplastic**	**Thermoplastic***
Cellulosic	*Cellulosic*	*Cellulosic*
Cotton	*Rayon*—Viscose	Acetate
Linen	Cuprammonium	
	Nitrocellulose	*Non-Cellulosic*
Minor Fibres	*Mineral*—Fibreglass	*Acrylic*—Acrilan
Abaca	Metallics	Crislan
Banana	Gold & silver	Orlan
Coir	Lame	Zefran
Hemp—Manila Hemp	Lurex	
New Zealand Hemp	Mellon	*Modacrylic*—Dynel
		Verel
	Protein	
Jute	Azlon	
Kena	Ardil	*Nylon*—Caprolan
Pina	Vicra	Nylonka
Paper		*Nytril*—Darvan
Ramie		*Olefin*—Prolene
Sisal		Reevon
		Polyster—Dacron
Asbestos—*Mineral*		Fortrel

*See Chapter 2.

Protein—Animal
Silk
Wool
Hair

Kodel
Vycron
Rubber—Last-ex
Saran
Spandex—Lycra
Vyrene
Vinal—Vinylon
Vinyon—Vinyon
Deflon

2

Identification of Textile Fabrics

Fibre identification is an important as well as an interesting subject. The variety of fibres, which modern science has discovered or invented, coupled with the various elaborate present-day methods and processes adopted in the manufacture and finishing of fabrics, are making their identification more and more difficult. Besides the consumer is interested in knowing the fibre content, which is ultimately going to affect the durability, appearance, comfort and suitability for laundering and usage. However, a knowledge of the characteristics of each kind of fibre helps a good deal, because every fibre has certain inherent qualities, which cannot be wholly reproduced in any imitation fibre. For instance, wool has its own characteristics and no other fibre has identical ones. The look and even the touch of pure wool flannel may be copied in the cotton flannelette and an inexperienced purchaser may find it difficult to distinguish the wool from the cotton. Fabrics made with newer blends, synthetic fibres are also difficult to judge merely by the appearance or touch. To identify such fabrics, the help of other tests, even of chemical tests is needed.

CHARACTERISTICS OF FIBRES COMMONLY USED IN FABRIC MANUFACTURE

NATURAL FIBRES

Cellulose-Fibres. These fibres have as their origin cellulose which is the principal matter of the plant cells. Cellulose is a

Protein—Animal
Silk
Wool
Hair

Kodel
Vycron
Rubber—Last-ex
Saran
Spandex—Lycra
Vyrene
Vinal—Vinylon
Vinyon—Vinyon
Deflon

2

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CHARACTERISTICS OF FIBRES COMMONLY USED IN FABRIC MANUFACTURE

NATURAL FIBRES

Cellulose-Fibres. These fibres have as their origin cellulose which is the principal matter of the plant cells. Cellulose is a

complex compound made up of carbon, hydrogen and oxygen with the molecular formula of $(C_6H_{10}O_5)n$. Cotton contains about 91 per cent and hemp rame and flax contain similarly large amounts of cellulose.

Cellulose is very sensitive to the action of mineral acids, and oxidising agents. However, it is quite resistant to alkalies, including strong caustic alkalies at high temperature and pressure.

Cellulosic fibres are low in resiliency so the fabrics wrinkle easily. Because of the high absorbency of the fibre they are comfortable for summer wear.

Animal-Fibres. Wool and silk are obtained from animals and are, therefore, called animal fibres. They have protein as one of the chief constituents and are made up of carbon, hydrogen and nitrogen. Wool contains sulphur in addition to the above elements. Both are destroyed by concentrated mineral acids but the specific action of the dilute acids is not very harmful on either. Hence, dilute acids are the basis of dyeing and finishing processes for the materials made from these fibres. Wool as well as silk burn with the peculiar odour of burning proteins like burning of hair, dals or milk. Alkalies have a harmful effect on both.

Animal fibres are very resilient and the wrinkles go out between wearings. However, they are bad conductors of heat and build up static electricity in cold and dry weather.

Wool loses about 40% of its strength when wet and silk, 15%. Wool has a natural crimp which helps to increase its elasticity and strength. It has a springiness or resilience which no other natural fibre possesses. Generally speaking, woollen fabrics are soft to the touch and present a fuzzy appearance. Worsteds are an exception, as their yarns are tightly twisted and firm. Wool, mixed with cotton, produces in the fabric a distinct hardness and heaviness about the material, which further tends to soil readily, fade and to wrinkle.

Silk has a luxurious soft texture, and a deep lustre. The sheen is not loud or bright as in man-made fabrics. This fibre is strong and retains most of its strength even when wet. It possesses elasticity and does not wear out soon. It is the lightest of all the fibres. Man-made fabrics may resemble pure silk in appearance but are not so light. Silks weighted with metallic salts are still heavier and produce a sharp crease on the line of the fold.

Man-made Fibres. Man-made fibres do not occur in fibre

form but have been turned into it by man, by breaking down from their original form and reassembled into different sort of structure, *e.g.*, rayons.

There are two types of man-made fibres : thermo-plastic and non-thermo-plastic.

Thermo-plastic fibres are those that soften with heat and thus become pliable, or if the heat is sufficiently high, will melt. These fibres are resistant to friction and wrinkling. They have low moisture contents which makes them an easy to care fabric, however, they are difficult to dye. Because of this property they build up static electricity in cold and dry weather like animal fibres.

Non-Thermo-plastic Fibres which neither soften or melt with the application of heat but will scorch or burn if the temperature is sufficiently high. As a group they are soft, absorbent, pliable and comfortable to wear. They do not accumulate static electricity. They, except for mineral fibres, may be cared much as the natural fibres.

Mineral Fibres. The mineral fibres are inorganic and used for fireproof fabrics. Asbestos is practically the only natural mineral fibre. It is used in fabrics intended for making firemen's dress, fire-proof curtains and screens, and for many industrial uses. It is also used for floor and table mats.

Mineral fibres are really drawn threads from metals, *e.g.*, gold, silver in tissues and brocades, and even baser metals are used in fabrics like tinsel. Thus, their origin is inorganic matter. They have an unusually bright sheen.

Cotton is limp and has a dull surface due to its fibre structure. It lacks the lustre and the natural creaminess of linen. It is very inflammable, and soils and crushes easily. It is heavier than comparable fabrics of other fibre content. It is brittle and is elastic when dry ; but, when moist, its strength and elasticity increases. Mercerized cotton is stronger, smoother and lustrous, hence it soils less readily than cotton.

Linen is smooth and cool to the touch as compared to cotton. Fine linen has a lustre almost equal to that of silk. It possesses crispness and is strong enough for hard wear. Moisture soaks through and spreads over linen fabrics much more quickly than in the case of cotton fabrics. Linen, when torn, has straight, glossy fibre-ends of unequal length. The fibre-ends of torn cotton curl and are lustreless. Linen yarn when not twisted,

shows a more or less parallel arrangement of glossy, individual fibres.

Rayon is produced to replace pure silk and so has a similar appearance, but with a better lustre usually ; though sometimes dull rayons are also produced. The rayon fibre if minutely examined, will be found to be coarser and heavier than a silk fibre. Rayon feels stiffer to the touch and is less elastic. It breaks more easily than silk, thus showing less strength. It loses strength when wet and regains it when dry.

SOME TESTS FOR THE IDENTIFICATION OF FIBRES

The following tests can be carried out without the help of a laboratory or expensive chemicals by a student of Textiles or by a housewife, interested enough to find out for herself the genuineness of the fibres of the material she wishes to purchase :

1. *Labels.* If the label gives the fibre content and tells how to take care of the fabric for satisfactory wear the consumer is most well-equipped to recognise the textile fabric she is purchasing. Unfortunately there is no standardisation in labelling in India and if at all there is any label the information is incomplete.

Visual Inspection. The first step in identification of a fibre is always inspection of a fabric for appearance and feel of the hand. The ability to identify the fibre by mere touch needs long experience and keen perception. It covers visual as well as textile senses.

Grasp the edge of a cloth between the thumb and the index finger with the thumb on the top. Rub the thumb and the forefinger across the cloth, lengthwise and then in a circle. Feel for pliability, elasticity or "give", warmth, softness, smoothness, body and hand. The vegetable fibres are usually cooler to touch than animal fibres or synthetics, a hundred per cent cotton fibre without a finish is lifeless and without a hand. Linen is cool, and pliable silk is very soft, lustrous, smooth and slippery and wool is warm and resilient. Rayon fabric is cooler to touch than acetate. However, it is very difficult to identify each fibre especially the synthetics by mere touch because the type of yarn used, finish and construction can often change the "feel" of the fabric.

Sense of Sight. This should be combined with the sense of touch. Observe lustre or sheen, fuzziness, flatness and coarseness of fabric.

GENERAL DIRECTIONS FOR THE BURNING TEST

1. Ignite a piece of fabric and note

(*a*) How readily it burns.

(*b*) Amount and shape of ash.

(*c*) Odour.

(*d*) Type of flame.

	a	*b*	*c*	*d*
Ransic flax cotton	Burn readily and char	Firm soft grey ash, smooth edge	Burning paper	Hot self-extinguishing
Orlon, acetate acrilan	Melt and burn	Forms hard plastic black bead	Chemical odour—acetate has a characteristic acetic odour	,,
Protein fibres silk wool and ham	Burn briefly and char	Black crushable ash	Burning hair	Self extinguishing.
Dacron, nylon, rayon, dynel	Melts and burns	Formation of beads	Chemical odour	,,
Glass and asbestos	——	Do not burn at all		

Specific Identification. *Physical tests* : Take out a yarn from the fabric, unravel it and note the length of the fibres. The length of the fibres gives an indication to the group it belongs to, such as all natural fibres except silk are staple fibres. If this test is combined with the feel and the appearance of the fabric it will help the consumer to be able to identify it.

Burning Test : It is a simple but a fairly reliable test. It can be conducted along with the visual inspection while purchasing fabrics to be sure of the genuineness of the fabrics. It may not be able to identify a fibre in particular but it can indicate the group such as cotton and linen will have the same results when burnt.

2. *Breaking test* (for cotton and linen) : Unravel some threads from the selvedge and the weft of the material. Single threads are then held between the fingers and pulled, they break. This may be repeated once or twice. A linen thread, being stronger, takes more strength to break than a cotton thread of the same thickness. Broken ends of the cotton thread are fluffy and brush-like, and the filaments or fibres which make the thread are short. In the case of linen, the ends are pointed and sharp, and the filaments or fibres, are not so short as those of cotton.

3. *Moisture Test* (for cotton and linen) : Linen absorbs moisture much more readily than cotton. Take a piece each of linen and cotton material and place a moistened finger under each piece. The linen piece will take up moisture much more readily than the cotton piece.

4. *Tearing Test* (for cotton and linen) : For this test, a fairly large piece of material is needed. It will be observed that (*i*) to tear a piece of linen, much more strength is required than to tear a piece of cotton, and (*ii*) when linen is torn, the sound produced is more actually sharp than when tearing cotton. The threads along the torn edge of linen are straight and look pointed, whilst similar threads of torn cotton are curly, fluffy and brush-like.

5. *Microscopic Test* : A microscope study of the fibres is almost indispensable for the student of Textiles, because this is one of the most reliable ways of arriving at the correct identification of fibres. In cases of fabrics woven out of a mixture of fibres, it is very difficult to get definite or clear results from any of the above mentioned tests. The same difficulty arises in the case of cotton and linen, specially when these fabrics are heavily sized or when cotton is mercerized. But a microscopic examina-

tion will not fail to give a correct identification of the fibre or fibres used in a fabric.

Tear out a fine fibre from the material to be tested and mount it on an eye glass with either water or a mixture of flycerol and water in the proportion of 1 : 10. Then fix the glass on the microscope and examine the fibre under high and low power and make a note of what you observe.

Wool. In a cross section of the woollen fibre, two distinct layers will be noticed. The outer layer consists of overlapping scales and the inner is a continuous rod containing pure fluid. A longitudinal section of the fibre will show only the overlapping outer scales.

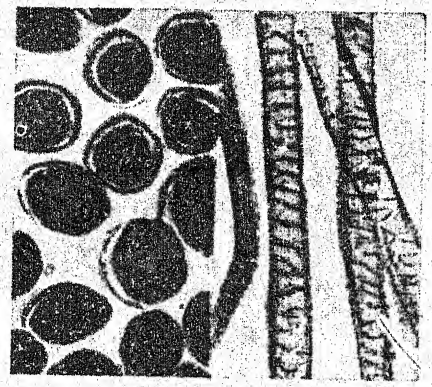


Fig. 1. Wool.

Silk. Silk is either "Cultivated' or is 'Wild' (uncultivated) Each will present a different picture under the microscope.

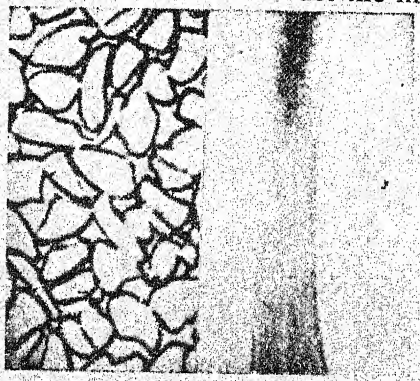


Fig. 2. Silk.

Cultivated silk just unreeled from the cocoons is called 'raw silk'. After being boiled to remove some of its gum, it is called

'pure white silk'. The 'raw silk' under a microscope shows double rod-like filaments, covered with lumps of gum which give the fibres striated or cracked appearance. The 'pure white silk' is cylindrical or rod-like in appearance without a central canal, and with a smooth surface reflecting light.

Wild silk differs from cultivated silk in appearance under the microscope. It is broad and flat, uneven in width and shows characteristic markings which run obliquely across the fibre.

Cotton. It appears as a hollow tube with a thin cell wall flattened and twisted. Under high-power magnification, the

Fig. 3. Cotton.

structure appears to be complicated. The fibre shows a central canal surrounded by a wall made up of many concentric layers of material.

Linen. This fibre shows a thick cell wall with a very narrow,

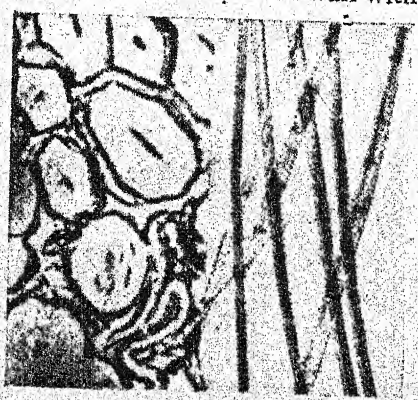


Fig. 4. Linen.

central canal, which is visible only under high-power magnifica-

tion. The fibre is characterised by peculiar markings known as 'nodes', which resemble the pointed ridges in a bamboo.

Ramie. This fibre resembles linen except that it shows much broader and more irregular markings.

Synthetic fibre. The viscose rayon shows its fibre to be corrugated and flattened with a little lustre. The cuprammoniums show round filaments of a bright lustre.

Nylon. Fibres are very fine and round, smooth and translucent.

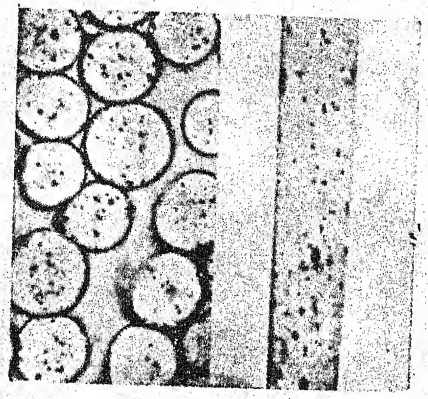


Fig. 5. Nylon.

Dacron fibres are straight, smooth and perfectly round. It has a characteristic speckled appearance.

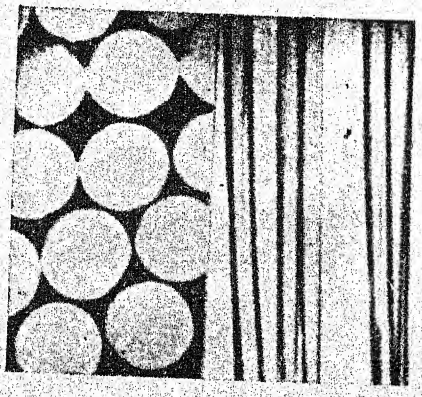


Fig. 6. Dacron.

Orlon is flat, smo oth and semi-dull.

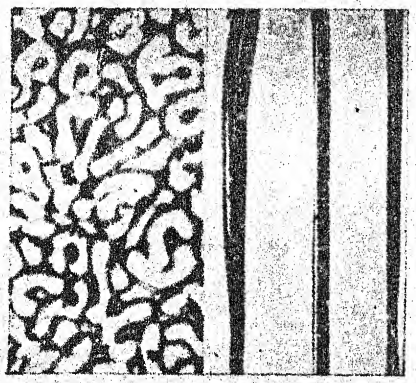


Fig. 7. Orlon.

6. *Chemical Tests.*

Solubility. These tests are the confirmatory tests along with the microscope test. They are very useful in fibre identification, location of the fibres in mixture and also the quality of different fibres in blends, by dissolving out each component of a particular fibre.

Cotton and Linen	1. Cuprammonium 2. Iodine.	Practical dissolution blue colour etc.
Silk and Wool	5% Caustic Soda	Completely dissolves wool
	Picric acid	Permanent yellow colour etc.
Rayons	Cuprammonium hydroxide	will completely dissolve
Acteate	Acetone	,, ,,
Nylon	90% Phenol	,, ,,
Airilan	Con. Nitric acid	,, ,,

CHEMICAL TESTS FOR IDENTIFICATION OF FIBRES

1. *Acetate.* If a sample of acetate is immersed in acetone, the acetate fibres are completely dissolved, other fibres with the

exception of Arnel and Dynel are not affected.

2. *Arnel.* When the specimen is immersed at room temperature for one hour in a mixture of 90 per cent methylene chloride and 10% ethyl alcohol, Arnel and Acetate will be dissolved. Other fibres will not be affected. To differentiate between Arnel and Acetate the samples are immersed in benzyl alcohol at 50°C for one hour. Arnel is unaffected and acetate dissolves.

3. *Nylon* is insoluble in boiling sodium hydroxide, this distinguishes it from most other fibres. The only common solvents in which nylon is soluble are concentrated formic acid, phenol and cresol.

4. *Dacron.* Like acetate and nylon, dacron is soluble in metacresol, however unlike acetate, it is not soluble in concentrated formic acid.

5. *Orlon* is not affected by common solvents such as glacial acetic acid, chloroform, acetone and 88 per cent formic acid.

6. *Acrilan* is insoluble in acetone, formic and 77 per cent sulphuric acid and sodium hypochlorite. It will dissolve in dimethyl formamide.

7. *Dynel* is highly resistant to a wide variety of inorganic acids, bases, salts, hydrocarbons and most organic solvents.

8. *Creslan* is not affected by glacial acetic acid, chloroform, acetone or 88 per cent formic acid. It can be differentiated from Orlon by microscopic appearance.

9. *Verel* when placed in Pyridene and heated turns reddish brown but does not dissolve.

10. *Zefran* has an affinity for a wide variety of dyes. It may be distinguished by a Fastucal pink dye test. A bleached specimen dyed in 1 per cent solution of this dye in a neutral bath at room temperature for three minutes becomes pink, while other fibres remain white.

11. *Darvan* will dissolve in dimethyl formamide at room temperature. It can be distinguished from Acrilan by Calico identification stain 2 tints Darvan greyish pink.

12. *Vicara* is used primarily as a blending fibre, particularly with wool, cotton, rayon and nylon. It can be distinguished

from wool by caustic soda 10 per cent in which wool dissolves but vicara does not. Hydrochloric acid will distinguish vicara from cotton, rayon, acetate and nylon. The acid will dissolve other fibres except vicara.

13. *Saran.* 100 per cent solution of acetone will not affect saran. Saran is soluble in ammonium hydroxide.

14. *Fibre glass* dissolves in phosphoric acid and hydrofluoric acid. These are the only two acids which will affect fibre glass.

3

Spinning-Yarn Construction

Spinning is the process of drawing out and twisting of a group or bundles of fibres into a continuous thread or yarn of sufficient strength to be woven or knitted into the fabrics.

In the beginning, the yarns were spun by man with bare hands without the aid of any tools and it must have been many centuries

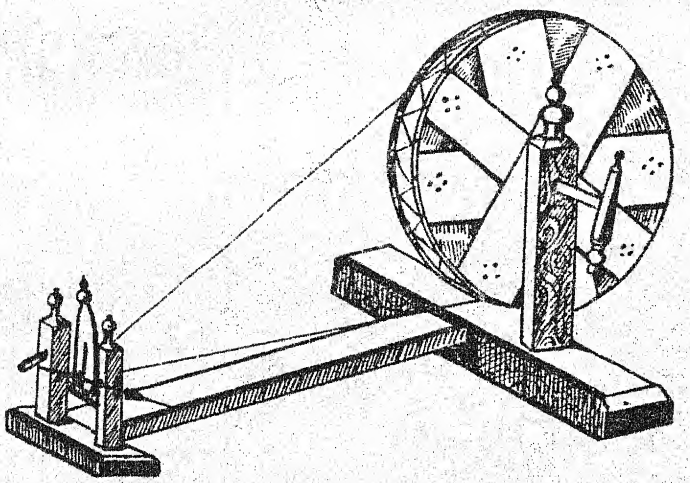


Fig . 8. A *Charkha.*

before the spindle was evolved for spinning. The spindle or 'Takli' still survives for spinning wool, silk and cotton yarn. It is the simplest tool used for spinning which consists of a round disc which is attached in the centre to a thin, smooth rod about 7

inches long (Fig. 32). The upper end of the rod has a groove or a hook which catches up the fibres. When the spinner pulls the bulk of the fibres, these are drawn out in a long strand. The spinner while simultaneously pulling the fibres, gives a twist to the spindle and lets it go. The spindle whirls round, and thus, twisting up the pulled fibres makes a continuous thread. The thread is then woven round the rod above the disc. The disc provides the necessary weight which quickens, increases and prolongs the revolving of the rod, thereby, the twisting of the fibres ensures a strong thread.

Charkha or the Spinning Wheel. Who does not know the '*Charkha*' in India? A *Charkha* is used for spinning yarn in the handloom industry in India. The yarn spun on the charkha is of various qualities. The famous 'Dacca muslins', which were uncomparable for their fineness, but alas are extinct now, were woven of a charkha yarn. The inimitable soft and light pashmina of Kashmir are still woven of the charkha spin yarn.

Charkhas are of various types. A simple design is shown in Fig. 8.

In the textile industries today, electrically driven machines are employed for spinning. Several machines are used to complete the process of spinning, which consists of stages, such as drawing out of the fibres in silvers, further drawing out of silvers to reduce size and to give slight twist-roving, and then spinning. There are two general methods of procedure. In one process, the action of drawing, twisting, and winding is continuous and this is called 'ring' spinning, and in the other, the drawing and twisting is stopped while the twisted thread is wound up (as in the case of hand spinning) and this is known as 'mule spinning'. The 'ring' spinning is a quicker process and has the advantage of reducing operating cost and increase production, but the mule spun yarn is finer, softer and of greater evenness.

In spinning yarns, whether by hand or machine, a difference has to be made in the yarn intended for warp and weft or filling. The warp yarn needs a greater amount of twists to produce a strong, firm thread which is used for the foundation of the fabric and is subjected to more strain and friction during the process of weaving. The yarn is given twists of a specified number of turns to the inch and are given either 5 or 2 twists. At first, a continuous thread or a strand of twisted fibres is made and several of these strands are twisted together to get the final yarn.

Size or Count. The yarn is described for its size or count. A skein of yarn, 840 yards in length, is known as a hank and is the basis for determining the count. If a hank of 840 yards weighs one pound, the yarn is number one, and if two hanks weigh one pound the yarn is of count 2.

Many variations are introduced in the preparation of yarn by mixing different kinds of fibres, by mixing different coloured threads or to produce texture, decoration or to add special properties to the fabrics.

The variations in yarn may be classified into twomain groups : (1) simple and (2) novelty yarns.

Simple yarn. In the construction of simple yarn, only one kind of fibre is used. The manner in which the fibres are twisted will be the same throughout the length of the yarn. Yarns known as simple, ply or cable, depending upon the number of strands they contain.

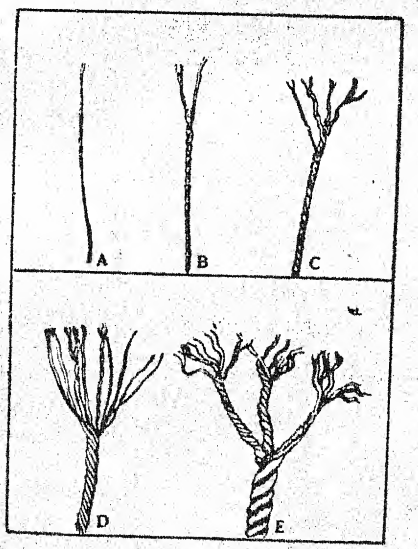


Fig. 9. Simple Yarn :
A, single strand. B, two ply. C, four ply. D, multiple strand. E, cable.

Single Strand Yarn. In this, a number of fibres are twisted together into a continuous length. The yarns consist of one kind of fibre and of one colour. This type of yarn is the one usually found in most standard fabrics for clothing and household use.

Ply Yarn. Two or more than two yarns are twisted together to form a ply yarn. These yarns are known as multiple strand yarn. If two single yarns are twisted together, the resulting yarn is known as two-ply yarn, if three are twisted together, three-ply yarn and so on.

Novelty Yarns. The construction of these yarns is of a complex nature and is varied in many ways. These yarns are usually ply yarns of different kinds of fibres or of different colours and are irregular rather than smooth. Single strand or yarn of various colours, sizes or fibres may be twisted together to form one complex yarn. Another variety is brought about in this kind of yarn by varying the tension or speed after intervals of certain length—thus, allowing one part to loop or twist around the other. Novelty yarns are also constructed from simple yarn by varying the amount of twist. The complex type of novelty yarn is used with two objects in view, one is to combine different fibres *e.g.*, cotton and rayon may be blended with or covered by wool or silk. This lowers the cost of production. The other purpose is to produce a novelty yarn for the construction of novelty yarns, at least one or two single yarns are used, one forms the foundation yarn known as a *base* or the *core* and the other, the *effect* yarn, which is wound or looped round the first one. A third yarn called binder yarn is often used to fasten or tie the effect yarn to the foundation yarn. These types of yarns are mostly used for drapery and unpholstery fabrics.

Types of Yarn

Slub Yarn. This yarn is composed of soft untwisted places at

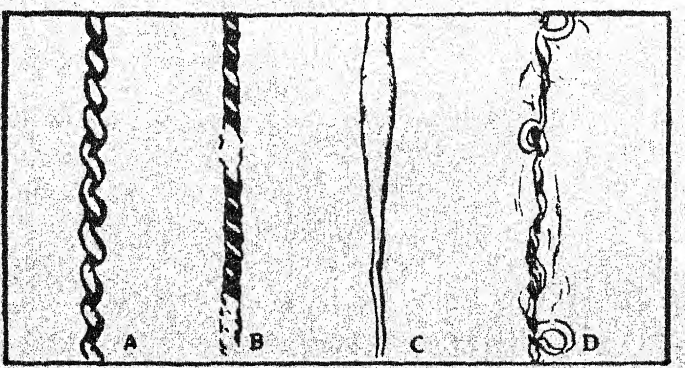


Fig. 10. Complex Yarn.

regular intervals. This may be a single strand yarn or may consist of two or more strands (Fig. 10).

Loop Yarn. This yarn consists of loops at intervals round a coarse foundation.

Knot or Spot Yarn. In this also two strands or yarns are used. One is the base, the other is used for forming knots or spots by an additional turn round the base yarn.

Corkscrew Yarn. This yarn is constructed by twisting together yarns of different diameters or by varying the rate of speed or the direction of the twist.

Bulk or textured yarn.

4

Construction of Textile Fabrics

Textile fabric is the term used for all kinds of cloth made from fibres or fine filaments by felting, knitting or weaving. Leather is not a textile fabric because it is not made from fibres and is not felted or knitted or woven. China glass and metal wear will not be included in textiles, but it is interesting to note that the modern textile industry has included metal, glass, soyabean, milk etc., which by nature are not fibrous. These non-fibrous materials, by the application of certain scientific processes, are converted into fine filaments, which are woven or knitted and these are then included under textile fibres.

Fabric is the term used for cloth produced by knitting, weaving or felting threads. The *thread* is made by twisting together a group of fine filaments or fibres. A fibre, therefore, is the finest continuous filament that is left after tearing out a thread.

Yarn is the term used for a continuous thread, which is made by twisting a group of fibres together. This process is called spinning. The spun thread or yarn is the base for weaving a cloth.

Weaving was used by man for making baskets, mats, roofs and walls of huts from the leaves, bark or skin of tress long before he thought of using it for making cloth. The earliest weaving was, therefore, the interlacing of two sets of materials. The same principle is used in weaving cloth. Simple weaving is the interlacing of two sets of yarns at right angles. Many variations

have, however, been introduced in the modern process of weaving, which add to the varieties of the cloth produced.

Knitting. Only one thread is used in this process. The yarn is wound round a needle to form loops which forms one row. This row of loops is caught by another row of loops and so on till a continuous length of cloth is made.

Felting is possible only with the fibres which can stick to one another firmly when pressure is applied, and thus, forms a cloth, *e.g.*, felted wool. The peculiar construction of the woollen fibre, which is surrounded by scales and the natural, gummy fluid present in it, makes this possible and successful. Felting then is the massing and flattening together of many fibres by beating and by applying pressure or steam to the fibres.

How weaving is done in the Textile Industry. Weaving is the most popular and largely used method for fabric construction. 'Warp' and 'Weft' are the technical terms used in weaving to denote respectively the yarns used lengthwise (warp) and across for filling (weft). The yarn used as warp is better and stronger than the other. In the early days, the warp or the good strong yarns were fastened to some objects on the ground and lifted separately one by one, as the filling or the weft thread was passed under or over them. Later on, the warp threads were fastened to a stick at each end and hung horizontally, which permitted an easier interlacing of the filling yarn. Then came the use of a frame to hold one set of threads, carefully in place whilst another set was being woven into it. This frame was composed of two sticks planted firmly on the ground holding a pole horizontally. A number of threads were tied on to this pole running down in parallel lines and their lower ends were weighted to prevent them from being blown away. This made the process of weaving much easier as the warp threads were held in place and the weaver could easily pass the shuttle or the carrier of the filling yarn, in and out of the warp yarn and then draw the filling threads as close to each other as possible to make the cloth. This frame may have been the simplest, as it was the first 'loom' used for weaving fabrics. Gradually, many improvements were brought about in the structure of loom, and now in large factories and mills, worked by power and with automatic stops, looms are used to produce fabrics in large quantities as well as in large varieties.

The Loom. The principal parts of a loom whether it is worked by hand or by power, are the same. They are :

1. *Beam* or a *Cylinder* on which the warp threads are wrapped in parallel lines and this is placed at the back of the loom. From here, the yarns pass to the front of the loom where they are attached to the cloth roll.

2. *Harness* (Fig. 11). This is a frame consisting of a number

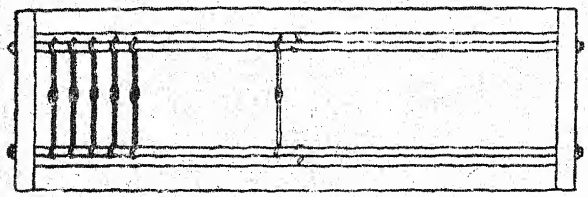


Fig. 11. A harness.

of wires known as heddles (Fig. 12). Each heddle contains an eye through which one or more warp yarns pass. The harness is

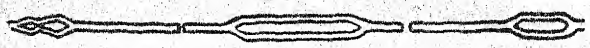


Fig. 12. A heddle.

the important part of the loom as it cotnrols the movement of the warp yarn, upwards or downwards, and thus ensures the correct running of the yarn over or below the warp yarn to produce the desired pattern in the cloth.

3. *Shuttle.* This holds the filling or the weft yarn and is

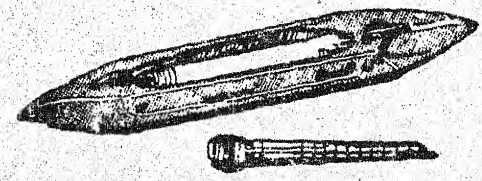


Fig. 13. A shuttle.

passed backwards and forwards across the loom (Fig. 13).

4. *Reed* is a frame (Fig. 14) which is located directly in front

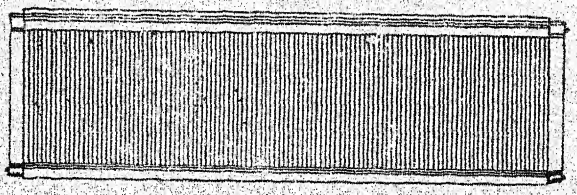


Fig. 14. A reed.

of the harness. This frame pushes forward each time the shuttle passes in-between the warp yarns, and presses back the filling thread in position.

The chief operations that are carried out simultaneously in weaving are :

1. One of the harnesses raises a certain number of warp-shedding threads and forms a shed for the shuttle to pass through (Fig. 15).

2. The shuttle when passing backwards and forwards through the shed, throws a filling yarn between the warp yarns. This is called picking.

3. The filling yarn is pushed back and pressed against the previous filling by means of the reed called batten and so the process is known as battening.

4. The warp thread is released from the warp beam and the finished cloth is wound round on a beam in front of the loom.

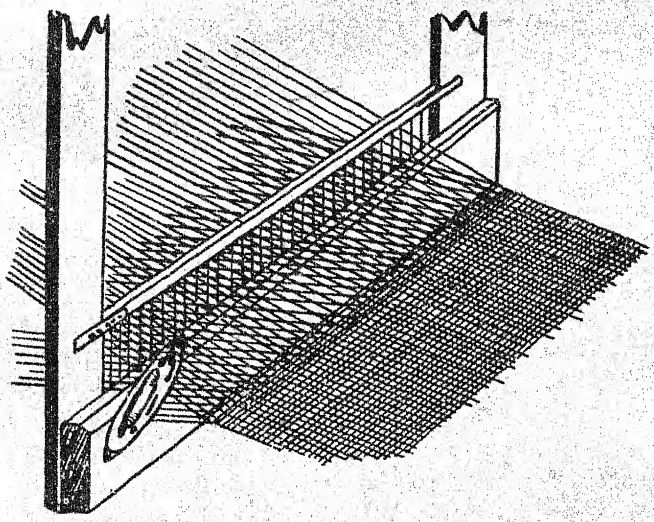


Fig. 15. Throwing of shuttle through the shed.

These operations continue till the desired length of cloth is obtained.

Selvedges. In most of the materials, the edges, which are known as selvedges, are made with heavier and more closely placed warp yarns, so that they do not unravel easily. The width of the selvedges varies from $\frac{1}{4}$ of an inch to $\frac{3}{4}$ of an inch.

The yarns are usually the same as those in the rest of the fabric except that they are made firmer and stronger by uncreasing the size or count of the way yarns in the selvedge. Fused selvedges or fabrics are made from the heat sensitive fibre. The applied heat melts and then seals the fibres together at the edges, *e.g.* ribbons are often made this way.

Count of the Cloth. Count is the technical term used to indicate the warp and the weft (the filling yarn or picks) in one square inch of fabric as it comes from the loom. If in a square inch of cloth warp and weft yarns number 100, the 'Count' of the cloth is 100 square of 100×100. If warps are 90 and the wefts are 80, the count is 90×80 and so on. A fabric in which the warp yarns do not number less than 90 and the weft yarns number 80 or thereabout, is a high count fabric. A very low count fabric is one in which the warp and the weft yarns number 28 and 24 respectively *e.g.*, in surgical gauze. The exact number of warp and the weft yarns in a square inch of fabric can be counted with the help of an ordinary magnifying glass held over a tightly stretched piece of cloth. But all this is not necessary if the aim is only to judge whether the cloth is of a high or low count. In the former, the weave is a very close one and in the latter tiny spaces are visible between the weaves, and the cloth is, therefore, more porous.

If the fabric is held against the light, the closeness of the weave or its porosity can be easily discerned. Thread count is an indication of the closeness of weave and can be used by the consumer in judging quality, ravelling, durability and the extent to which the fabric will shrink and retain its shape. If the fabric has a high thread count it will have less potential shrinkage.

Balance of Cloth. Low count fabrics are woven with a fewer interlacings to the inch either to make the fabric light-weight and porous or to cheapen it. The balance of fabric is determined by the proportion of warp yarn to weft yarns. If the number of warp and weft yarns is nearly the same in a square inch, the fabric has a good balance. For example, gingham with a count of 96×88 and gauze with a count of 28×24 are materials with a good balance, but a shirting with 100 warps and 50 picks has a poor balance. A fabric with a poor balance when held in the light will show yarns running in one way *i.e.*, lengthwise only. Such a fabric is not good as it does not stand hard wear and many washings.

The strength of the fabric can also be tested by tightly holding a stretched piece of fabric and rubbing it hard repeatedly with the thumb. The rubbing should be done one way, namely downwards. If any yarn slips out of its place and the tiny spaces between the weaves of pores become enlarged, the fabric is not as strong as it looks.

Weaves. Weaves are named according to the system or design followed in interlacing warp and weft yarns. The basic weaves used in fabric construction are : Plain weave and Twill weave and Satin weave. These are the foundation weaves and form the basis of all the other types, *e.g.* Double, Pile and Jacquard and so are called combination or derivative weaves.

Plain Weave (Fig. 16). This weave resembles the process of darning. It consists of an alternate interlacing of the warp and filling yarn, (over one and under the other) along the entire width of the fabric. This weave is also known as homespun cotton or tabby weave. The simplest loom for plain weave, has two harnesses. The alternate warp yarn is drawn in through the heddle eye of one harness and the remaining warp ends are drawn in through the heddle eye of the other. In the operation of this weave one harness is raised which separates the alternate warp yarns to form a shed (Fig. 15) and then the shuttle carrying the filling yarn is passed through. Next, the lifted harness is lowered and the other harness is raised to form a new shed for the return passage of the shuttle. Each time, the filling yarn is pressed back into place by means of the reed, and thus cloth is made. Plain weave fabrics have no right or wrong side. Plain weaving provides a wide scope for introducing variations in the fabrics ; such as the use of yarns of different colours of different fibres, or of textured yarn. These will produce a large variety of fabrics. For example, seersucker is woven with yarns having different degrees of twist and with different degrees of tension in the loom. Another variation is made by tightly twisted warp and loosely twisted weft which makes it easy for a napping finish to be given to it, *e.g.*, flannelettes. Striped material piards gingham are made by using different coloured yarns at intervals. Plain weave is made interesting by printing and embossing. Plain weaving also allows the use of many

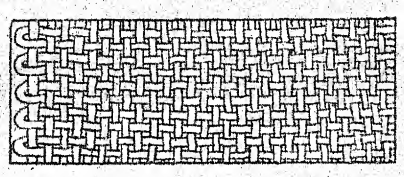


Fig. 16. Plain weave.

different finishing processes to produce varieties and different styles in fabrics.

Plain weave is used in the construction of fabrics from almost all textile yarns cheapest to produce. It is the most serviceable of all weaves, as fabrics with this weave are easy to wash, dry clean, wear well and are comparatively inexpensive.

PLAIN WEAVE FABRICS

Cotton. Calico, cambric, canvas, cheese cloth, chintz, cretonne, cotton, crepe, flannelette, gingham, long cloth, muslin, organdy, seersucker and voile.

Linen. Cambric, dress linen, handkerchief linen and towelling.

Wool. Homespun, crepe, flannel.

Silk. Chiffon, crepe de chine, crepe georgette, shantung, taffetta and voile.

Rayon. Chiffon, crepe, geogette, seersucker, organdy, taffetta and voile.

PLAIN WEAVE VARIATION

Rib Weave. This is a variation of plain weave. In this, heavier yarns are used in the warp than those in the weft, and this produces a ribbed effect. Sometimes, the order is reversed and the heavier yarn is used in the weft. Ego eve, faille gross grain, bengalene, ottoman, broad cloths poplin and tabralco are some of the examples.

Basket Weave. (Fig. 17). Basket weave is a balanced weave. The fabrics with basket weave have flenth and if the count is not very high the fabric is even porous and pliable. However, fabrics with arrangements such as 3×3, 4×4, 6×6 snag easily. In this two or more yarns in both warp and filling are treated as one, and interlaced as in plain weave. This weave is used in materials for sport coats and suits. This is a comparatively loose weave and therefore, the fabrics are more likely to shrink.

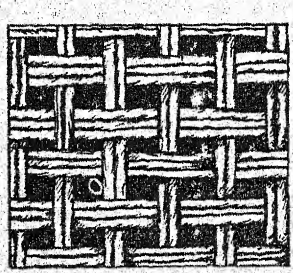


Fig. 17. Basket weave.

Twill Weave (Fig. 18.) This weave forms wales diagonally across the face of the cloth. This is brought about by the interlacing of warp and filling yarns with a progression of one at the point of interlacing (*e.g.*, if the first filling covers warp

yarns 2, 3, 4, 5, 6, 8 and 9 and goes under 1, 4, 7 then the second filling will go over 1, 3, 4, 6, 7, 9 and 10 and will go under 2, 5, 8 and so on). The simplest form of the twill weave is made by throwing the filling yarn over two warp yarns, then under one, over two, under one and so on, with a progression of one. This weave requires at least three shifts of the loom to complete the unit of the design and three harnesses. In this weave, either the warp or the filling may be used to form the face of the cloth. The progression, which produces the characteristic diagonal effect of the twill may be to the right or to the left. It may be plain or varied which makes the cloth decorative. The common variation in the twill weave is herring bone. In this, the diagonal effect runs in one direction a few rows and then in the opposite direction. The whole pattern is thus repeated. Another variation is made to form a diamond pattern. Variations are also introduced by using yarns of different sizes, qualities and colours. Twill weave has fewer points of interlacings than plain weave. So it permits closer picking of warp yarns to produce heavier fabrics which results in longer wear.

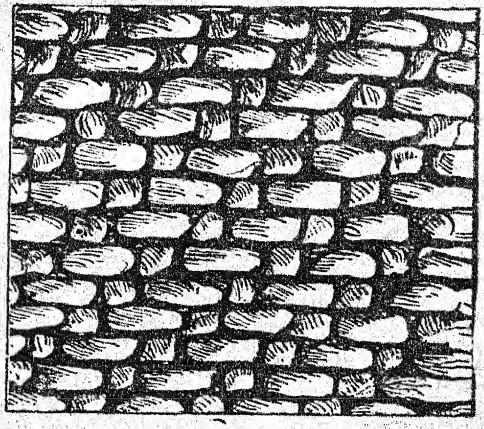


Fig. 18. Twill weave.

Twill weave produces strong material because of the tightly twisted yarns which are used to bring out the diagonal effect, and the compactness of its construction. Twill weave fabrics are more expensive because of their elaborate construction, but they are strong and stand hard and long wear. This weave is generally used in wool and cotton fabrics, where durability is a prime necessity. Twill-weave fabrics do not show dirt or dust

as much as the fabric woven in plain weaves do, and are, therefore, more suitable for dresses, men's shirts and suits and children's garments.

The side on which the diagonal effect is more prominent is the right side of the cloth. But when twill-weave fabrics are finished by 'napping', the napped side is the right-side.

TWILL-WEAVE FABRICS

Cotton. Covert cloth, denim, drill, gabardine, jean, khaki, serge.

Linen. Table linen, towels, drills and ticking.

Wool. Covert cloth, broad cloth, cashmere, flannel, gabardine, tweed, serge, worsted.

Silk. Twill, serge, Surat.

Satin Weave (Fig. 19). This weave differs from the twill weave as in this the interlacing of the warp and filling yarns is irregular. The filling yarn passes under several warp yarns thus throwing up the warp on the surface of the cloth and the filling on the inside or wrong side of the cloth. The exposed filling or warp are called floats. The long warp floats in this weave produce a smooth surface with a characteristic lustre.

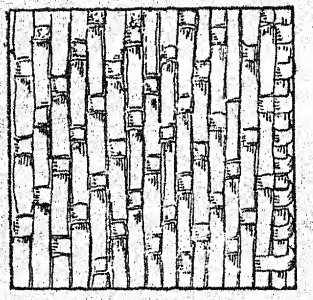


Fig. 19. Satin weave.

Sateen Weave (Fig. 20) is a variation of Satin weave. In this the filling yarn is thrown up to the surface, *i.e.*, the filling yarn is passed over several warp threads. The floats in sateen are generally shorter than those in the satin weave.

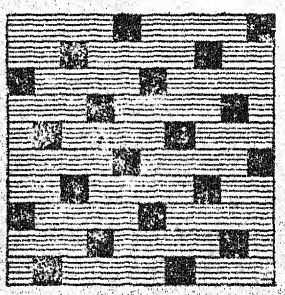


Fig. 20. Sateen weave.

Other variations may be introduced by using different qualities of yarns, such as tightly or loosely twisted yarns or by throwing long or short floats upon the surface. Then again, a combination of satin and sateen weaves may be used to produce elaborate or figured designs.

The satin and sateen weaves require more shafts in weaving than are needed in the plain or twill weaves and, therefore,

fabrics of the former weaves are more expensive. The Satin or Sateen weave fabrics are more decorative than serviceable. These are durable only if they are not subjected to excessive or hard use. Satins or Sateens with short floats are more durable.

To differentiate between satin and sateen weaves, fingers are passed over the cloth to determine the direction of the floats. If the fingers run smoohtly and easily along the length of the fabric, thus indicating the presence of the warp floats, the weave is satin. This weave is most commonly used in the silks and rayons. Satins are extremely lustrous and smooth. The sateen weave will have floats running on the cross side of the fabric. This weave is used in a few mercerised cotton fabrics. These fabrics are not as lustrous or smooth as satin.

Satin and Sateen Fabrics. Dress satin, slipper satin, satin crepe, satin georgettee, satin canton, satin twill, sateen, venetian sateen.

NOVELTY WEAVES

Figure Weaving. Many fabrics have various types of designs woven into them. There are two methods of making these figure weaves—Jacquard and Dobby. A Jacquard loom is necessary for more elaborate patterns but a Dobby attachment is sufficient for simple and small geometrical designs.

Dobby Weave. Only a few geometrical designs are possible in this weave, such as the diamond patterns. The Dobby attachment consists of a chain of narrow strips of wood hung on the top of the loom. Pegs are inserted in each of the strips to indicate the pattern. These strips of wood control the movement of the harness to form a shed. Another chain of strips of wood controls the shuttle, and thus the designs are woven in the fabric. The Dobby attachment can control no more than twenty-five harness. This is the reason for the limited number of designs.

Examples of Dobby weave are the "Birds eye" used in diapers and sharkskin suiting Huckaback or huck towelling of small diamond designs are also made in the Dobby weave.

Jacquard Weave. The Jacquard loom was invented by a French man, Joseph Jacquard, in 1801. The intricate arrangement of this loom weaves the most beautiful and elaborate designs in the fabrics. In this loom, every individual warp is controlled independently and not in series as in ordinary looms. In the place of harnesses, a series of oblong, punched cards

called 'Jacquard card' control the raising of the warps. As many cards as there are picks are used in the design. The designs are first worked out on a graph paper in points. Then these points of the designs are punched on the cards in the same order and are rotated over a cylinder on the top of the loom. Long cords which hold fine steel wires are also attached to another set of horizontal wires called 'needles' on the top of the loom. Each of the steel wires has an eye through which a warp yarn is threaded. In working the loom, the needles press forward against a Jacquard Card. The needles which go through the punched holes in the card pull certain cords which in their turn pull the steel wires and so the warps are raised to form a shed simul-

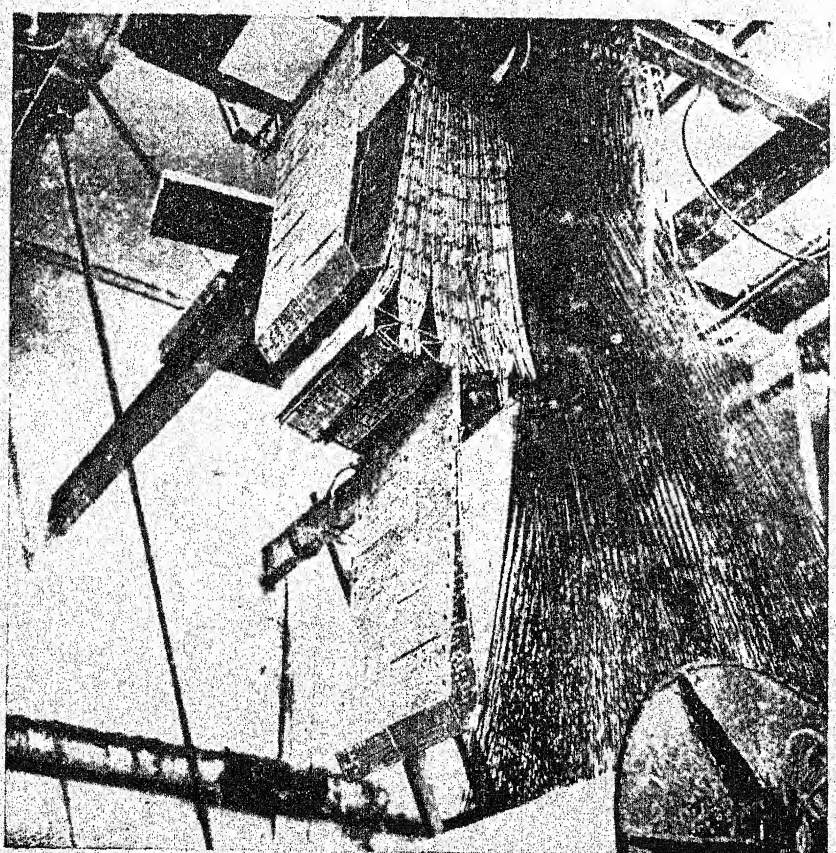


Fig. 21. The top part of the Jacquard loom showing the Jacquard cards.

taneously. The shuttle passes through throwing in the filling yarn. The cylinder which holds the cards, turns slightly and another card is raised. This again forms a contact with the needles, a new shred is formed, and the filling yarn is passed through. This process is continued till all the cards have been used once. The pattern is thus completed. The process is then repeated till the entire length of the cloth is woven.

The Jacquard weave fabrics are fairly expensive because of (*i*) the elaborate process used for this weave, and (*ii*) the time and skill required for preparing the cards.

The actual weave is a combination of two or more kinds of fundamental weaves or a variation of such combinations. For example, in damask the design is woven in sateen weave with filling floats, and the ground of the cloth is in satin weave with warp floats. In brocades, the design may be in the twill weave and the background in satin weave.

The face and back of the fabrics in figured weaves may show the same design (as in the case of huckaback) or in the reverse as

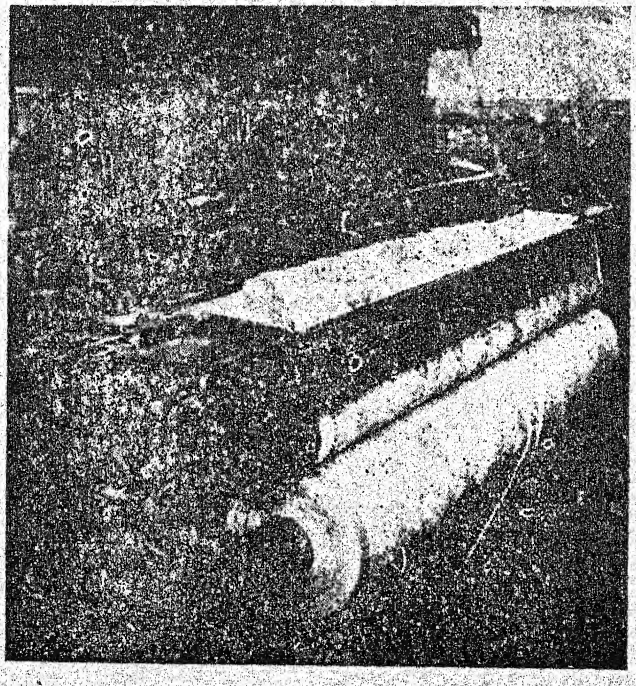


Fig. 22. Lower part of the Jacquard loom showing the woven cloth.

in damask, the design may be totally different on either side as in brocades.

The durability of the figured fabrics depends on the length of the floats, and the kind of the yarn. Long floats increase the sheen and softness of the fabric but affect its wearing quality.

JACQUARD WOVEN FABRICS

Cotton. Damask, Terry cloth (Towelling borders) Tapestry.
Linen. Damask.
Wool. Tapestry.
Silks. Damask, Brocade, Tapestry.
Rayon. Damask, Brocade.

Pile Weaving. In this type of fabric construction, three sets of yarns are used in such a manner as to form loops on the surface of the cloth. In some fabrics, two sets of warp and one of filling yarns are used, and in some, one of the warp and two of filling are used. Generally, plain or twill weave is used for making the ground fabric from one set of warp and one set of filling yarn, and the third set of yarn makes the loops or the floats. The loops of the floats are cut either by hand or by machinery and brushed up to form the pile. Velvets and velveteens are pile fabrics where filling yarn forms the loop or the pile.

A large variety of fabrics are produced with this method of fabric construction, by using more than three sets of yarn or by the way in which the loop or the pile is made.

Turkish towelling is an example of the pile weaving where the loops are left un-cut. This weave is generally known as Terry Weave. Pile weave is generally used for constructing silk and rayon fabrics, as this weave sets off their natural richness and lustrous appearance. Pile fabrics in silk are soft to the touch and also have a good fall. Velveteen, a cotton pile-weave fabric, is rather heavy and not as soft and lustrous as silk velvets.

A pile fabric with high thread count and close pile is strong and has a good weaving quality. In Terry cloth, the loops must be firmly held to the ground which is made of strong warp yarns. If the loops in Terry cloth can be easily pulled out, the cloth is weak and will not stand hard wear and washing.

FABRICS IN PILE WEAVE

Cotton. Velveteen, Terry cloth, Corduroy, Plush, Chenille.
Wool. Corduroy, Plush and Rugs.

Silk. Velvet, Plush, Chenille.

Rayon. Velvet, Chenille.

Double Weave. For this weave five or more sets of yarns are used and any one of the several types of weaves may be used for interlacing. Some fabrics are woven with two sets of warp yarns and two sets of filling. One set of warp and two sets of filling are used in the construction of fabrics with unusual designs to give the fabric some additional bulk. The warp yarn does not appear in the design and the filling yarns may have two different colours, one for the face and one for the reverse. This type of material may be in wool or in cotton. Two sets of warp and one set of filling will produce a fabric which is called double faced. In this fabric construction, two entirely different types of yarns may be used for the face and for the reverse. Examples of these fabrics are ribbons and other narrow strips of materials used for trimmings. Double weaving is done in various combinations, to produce a large variety in fabrics. Pique fabrics are examples of the fabrics constructed by double weave. Warp pique is constructed with one set of warp yarns and two sets of filling yarns. The characteristic stripes of pique are formed by two warp yarns that are woven plain throughout the fabric. A pique made from fine yarns and with close construction will have good weaving qualities.

Regular Pique. These are woven from two sets of warp and one set of filling yarn. The warp for the back of the cloth is held taut and the warp for the face is woven slack. The rib is formed by raising the tight back warp to the face along the same pique, thus, pulling the cloth down along the line. The face warp are generally twice as many as the back warp yarns. Filling yarns are used as stuffing yarns to make the rib more prominent.

5

Finishes

Fabrics, as they come out of the loom, are not at all attractive. They get dirty during the processes of spinning and weaving. In order to clean them, improve their appearance, bring out their distinctive characteristics; and prepare them for the market, they are made to undergo certain additional processes after they have left the loom. 'Finishing' is the term used to cover all these processes. The aim of the process of finishing may be enumerated as follows:—

1. *To improve the appearance and enhance the attractiveness of the material.* Some fabrics, which look dull and drab in colour because they have been soiled in the spinning and weaving processes, need cleaning and bleaching. Sometimes knots, some loose threads or thin places are overlooked and left in the fabric during the weaving process. So the fabrics are examined to discover and remove these defects. Finishes like napping and raising the fuzz on the surface will remove or cover such defects. Then the fabrics which do not naturally have a smooth texture or a desirable feel to the touch, such as cotton, need a treatment like calendering to smoothen the texture.

2. *To improve suitability and utility.* Some fabrics are not quite suitable for dresses because they are lump, lifeless, and lack the qualities of draping and preserving the shape and style of the garments. These qualities are imparted to such fabrics by producing in them the 'crepe effect'.

To further improve the draping quality, the fabrics are also treated with crease resisting finishes. Then there are other treat-

ments which have the effect of making fabrics water-proof, fire-proof and mildew-proof.)

Finishings are also given to resist shrinkage. The treatment of sizing and calendering produces a dust resisting effect in the fabric and thus increases its capacity to give more and better service.

3. *To produce variety.* This is done either (*i*) by varying the surface finish *e.g.*, napping, beetling, creping or smooth finishing, or (*ii*) by dyeing or printing in different colours or designs.) Sometimes, the yarn is dyed before it is woven.

4. *To increase the weight of stiffness.* This is done by treating fabrics with starch or gum. Some fabrics are treated with chemicals to increase weight, and produce *e.g.*, weighted silk.

5. *To produce imitations.* Some finishing processes are used to alter the original appearance of a fabric and so produce imitations, *e.g.*, cotton is mercerised to produce a silky smooth texture or it is napped to look like wool, *e.g.*, flannelette.

Some fabrics need many more finishes than others. Silk and linen fibres are long, smooth and straight and have certain other intrinsic properties which naturally give these fabrics a smooth and glossy texture and an attractive appearance. But cotton and wool have to undergo a number of finishes before these can be presented in the market. Worsted fabrics need less finishing than woollens. Most of the synthetic fibres are also lustrous, smooth and long, and so need but little finishing.

The processes of finishing are many and varied and their suitability for a particular kind of fabric is determined, to a large extent, by the following factors :—

1. *The nature of the fibre,* that is, its physical properties such as its power of absorption, swelling capacity and the reaction of the fibre to the application of friction and pressure. Also, its chemical nature and its reaction to the chemical compounds.

2. *The type of yarn and the kinds of weave,* as these affect the power of absorption plain weaving responds to a number of finishing treatments but a fancy weave does not lend itself to many of these processes. Some finishes are of a permanent nature, others wear off with age and laundering.

Most of the simple finishing processes consist of the application of pressure, moisture and heat. These may be grouped under physical or mechanical processes. This group includes

stretching or tentering, calendering, beetling, napping, embossing and glazing.

Another group includes the processes which give a filling to the cloth, and add to its weight. The filling agents used are starch, gum, epsom salt, china clay and other mineral fillers.

Yet another group includes the processes of softening which is carried out by the application of oils, fats, waxes, glycerine, glucose and magnesium chloride.

Then there are the chemical treatments, such as mercerising, chlorination of wool, water and fire proofing etc.

The chemical finishes are of a more lasting nature.

All fabrics undergo certain processes, such as mending, scouring, straightening, pressing and drying. The fabrics after they are taken off from the loom, are inspected for defects, such as thin places, knots etc. The holes and thin places are mended, the knots are brought to the surface and are clipped off. Then the fabrics are washed and boiled (scouring), straightened, pressed and dried.

Bleaching, where necessary, is done after the mending process.

THE MECHANICAL PROCESS

Beetling. This process produces lustre and softness and gives the fabric a firm, leathery feel. Beetling was originally done by beating the surface with wooden mallets, but now a machine with a number of steel hammers is used. The hammers rise and fall as the machine rotates and pounds the material which passes through the machine. The fibres are flattened, the weaves are closed and thus the desired lustrous effect is produced.

Cotton and linen are finished by the process. Cottons after undergoing this process look like linen.

Brushing and Shearing. This process removes small fibres sticking out on the surface of the cloth and clips any short ends of yarn. This process consists of the material passing through two roller brushes. Both sides of the material are cleaned at the same time.

Schreinerizing. In spite of the evolution of many man-made fibres cotton still reigns supreme as a "many purpose" fibre. Much research is being done to give to it properties that other fabrics have and it lacks. For instance it lacks the strength of Nylon fabrics and the lustre of silk. Schreinerizing is a process similar to one mentioned above but in this case additively

lustre is given to cotton. Briefly steam roller having thousands of engrained diagonal lines press on the cloth as it is rolled between them. Reflection of light from their ridges give the cloth a lustrous effect. Needless to say these lines go on disappearing with repeated washings. Unlike mercerising schreinerizing does not impart a permanent lustre to cotton.

Calendering. This is the final process and consists of pressing the material after it has passed through other necessary processes. It smoothes out wrinkles, adds sheen, and gives a smooth even surface to the fabric. The fabric is passed between very hot and highly polished rollers. For glass the fabric is first stiffened with sizing before it is calendered. To increase the lusture, the process is repeated several times.

Cotton, rayon, linen and silk are passed through this process as a final finish.

Sanforising. All textile fabrics when they are made contain certain threads which are stretched because of their being interlaced with each other. The size of the thread if removed from its fabric will be smaller than when it is interwoven. And that is what happens when you wash most fabrics, they try to regain their original size and hence garments made out of fabrics often become smaller than what they were after a first wash. To get rid of this defect a new process has been evolved which is called sanforising. By this process the manufacturers now guarantee that the finished product will not shrink or stretch after washing. It is difficult to give details but briefly in this process the length contraction is obtained by passing the contracted fabric between a thick cloth and the surface of (steam heated) smooth metallic-roller. As the fabric goes between the cloth and the roller it is set and smoothed in its closed up state and the fabric now cannot shrink.

Crinkled or Crepe effect. The Creping process is accomplished either by a mechanical or by a chemical treatment.

The mechanical process consists of passing the material between two hot rollers. The rollers have regular indentations at regular intervals which produce the waved and crepe effect on the material. This effect is not very lasting. (For chemical treatment, see under Chemical Finishes.)

Embossing. By this process, a pattern or a design is

embossed on fabrics. This machine consists of two rollers, one of them is covered with cloth and the other is engraved with the design. The cloth, covering one of the rollers, is moistened with soapy water. When the machine operates the impression of the pattern is taken on the covered roller. Then the material is passed through these rollers which are heated by steam. As the material is pressed between the two rollers, it gets the imprint of the design.

Cotton, linen, silk and rayon are often given this finish.

Glazing. The process produces a highly glazed finish or fabrics. The machine consists of three rollers, one of which (the middle one) is covered with cloth. The fabric stiffened with sizing is passed between the first two rollers and then under the third one which rotates at a great speed and gives a high sheen to the fabric.

Cotton fabrics like chintz are finished by this process.

Moireing. This process produces a watery line effect on the material. The machinery consists of three steam rollers. The top roller is covered with cloth. The material passes between the first and the second roller and then under the 'top' (cloth covered) roller which rotates at a greater speed and presses the fabric heavily and produces the desired effect.

Rayons are generally finished by this process. This finish on acetate rayons is very permanent.

Napping. This process is used to produce a raised effect on the cloth and to impart to it a soft and pleasing feel. It also covers up defects, if any, and renders the fabric warm because of the spaces created between the raised fibres which trap and hold the air.

The fabric is first passed over a revolving cylinder covered with teasels or short bent wires. These teasels or wires scratch the fibres up to the surface so as to form a nap. The nap is then clipped to a uniform length (height) by passing it through a shearing machine. Napped surfaces may be given a variety by pressing the naps flat or by causing the raised fibres to cure or ripple or by giving it a high gloss.

Cottons and woollen are finished by this process. Cotton after this fuzzing finish resembles wool *e.g.*, flannelette.

Smooth Finish. The loose, projecting fibres on either the yarn or the fabrics, are singed off by passing a material or skeins

of yarn through a gas flame or even an electric plate at a rapid speed. Then the fabric is passed through a calender for pressing.

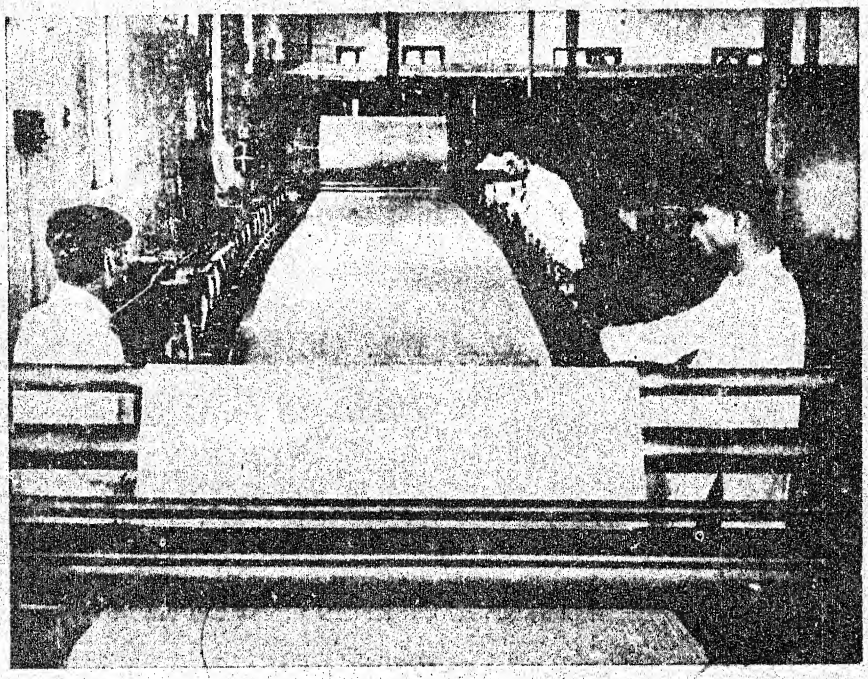


Fig 23. Tentering or the straightening of fabric.

Tentering. (Fig. 23). The fabric after passing through the process of dyeing or wet finishing gets uneven at the edges. The process of tentering straightens out the edges and the weaves of the fabrics, and makes it even in the width. The fabric is passed through a frame. A chain on either side of the frame catches the selvedges of the fabric and controls the pulling process for straightening out the material. Steam coils are arranged underneath the frame and this device dries the material during the process of stretching.

This process is used on silk, wool, cotton, rayon and linen.

Finishes with Filling Agents. The aims of the use filling or sizing agents on fabrics are (*i*) to stiffen the fabric, (*ii*) to soften it, (*iii*) to impart to it a body and weight (*iv*) to give it a glazed smooth finish.

Sizing and Dressing. This process is used for cottons. The filling agents are starch, China clay, magnesium sulphate and

magnesium chloride. The process consists of passing the material between two rollers heated by steam. One of the rollers is continuously covered with sizing solution which is dropped on to it in a regulated stream. Addition of paraffin, glycerine or oil to the sizing solution will produce softness in the fabric, and wax will give it a gloss and lustre.

Most of the cotton fabrics, such as sheeting, dress materials, organdies and cambrics are sized by the above method. Linen which has natural firm body and gloss is not sized unless it is of a poor quality.

The sizing wears off after repeated laundering.

Weighting of Silk and Wool. Weighting is the term used for filling in silk and wool. The filling agents are metallic salts.

Silk. Silks are weighted either at the yarn stage or as woven material. It is also weighted during the process of dyeing by adding the weighting substance to the dye. The usual weighting substances used are tin chloride and tannate. Fibres absorb these salts and swell. These are not removed by washing. Heavily weighted silk has a poor wearing quality. It cracks at the folds and rots with perspiration.

Wool. Wool is weighted with magnesium chloride so that the cloth absorbs more moisture and its weight is thus increased. This is not, however, a practice used generally by all manufacturers.

CHEMICAL FINISHES

These consist of a process of treating the fabrics with chemical reagents which change either the appearance or the intrinsic properties of the cloth, *e.g.*, mercerising changes the appearance of the cloth, whereas crease resistant finishes or fire-proofing changes its properties.

Mercerising. This process gives a high degree of lustre to cottons through the chemical action of caustic soda. John Mercer, a calico printer in England, first discovered in 1844, that the application of a strong solution of caustic soda made cotton cloth transparent. The process consists of impregnating the yarn or the fabric with cold caustic soda solution, applied under tension to reduce shrinkage, and to increase the lustre. The process removes the twist in the fibre and thus causes the fibre to become smooth and cylindrical which produces a silky effect. Mercerised cotton absorbs dyes more readily.

Crease Resistant Finish. The process is used mostly for cotton because cotton, owing to its natural inelasticity, wrinkles

badly. In this process the fabrics are impregnated with a solution of synthetic resin, such as (*i*) phenol formaldehyde, (*ii*) urea formaldehyde and (*iii*) acrylic resins, and dried by a fairly high temperature in a moist atmosphere. This forms a clear insoluble resin in the fibre, which improves the resilience of the fabric. Urea formaldehyde is colourless and can be used for white and light coloured fabrics but phenol formaldehyde being dark coloured is used for dark coloured fabrics only.

Creping. Creping by the chemical process is the treatment of fabrics with caustic soda. The soda paste is applied to fabrics in a definite design of stripes or figures. The parts to which the paste is applied shrink leaving the other parts unshrunk ; thus the effect of a puckered or creped material will be produced. Another method is to apply a paste of a substance which resists the effect of caustic soda to the fabric in a definite design, and then place the fabric in a solution of caustic soda. The untreated places will shrink and produce the crepe effect. This method is more lasting than the mechanical one. The crepe produced in weaving is of course quite different to the crepe effect produced by these finishes.

Fire-Proof Finish. A simple method which consists of a treatment with boric acid and borax is described in Chapter 7, Part II. This, however, dissolves in water. Another method is the treatment of the fabric with chlorinated compounds, such as Vinyle Chloride or chlorinated rubber and antimony oxide. This solution covers the fabric with a thin, non-inflammable film which renders the fabric fire-proof.

DYEING

Dyeing may also be called a finishing process as it colours the fabric and so adds to its beauty. Dyeing is a very ancient Indian art which the other countries learnt from the Indians. In the earliest stages, the fabrics were coloured with the juices of flowers, fruits, stems, leaves and barks of plants and trees. Later on, dye stuffs from vegetable and mineral sources came into use. The chemical dyes are the discovery of comparatively recent times. (For a description of the dyes see Chapter 14, Part II.)

There are a number of methods used for Dyeing the fabrics at various stages.

Raw Stock-dyeing. Fibres of wool, cotton, linen and waste silk are dyed. The stock of fibres are rotated in the dye bath, then removed and dried.

Slub-dyeing. This method is used in dyeing wool fibres after these have been combed. The skeins of wool slivers are hung on rods. The rods are then placed on the top of the dye bath. The

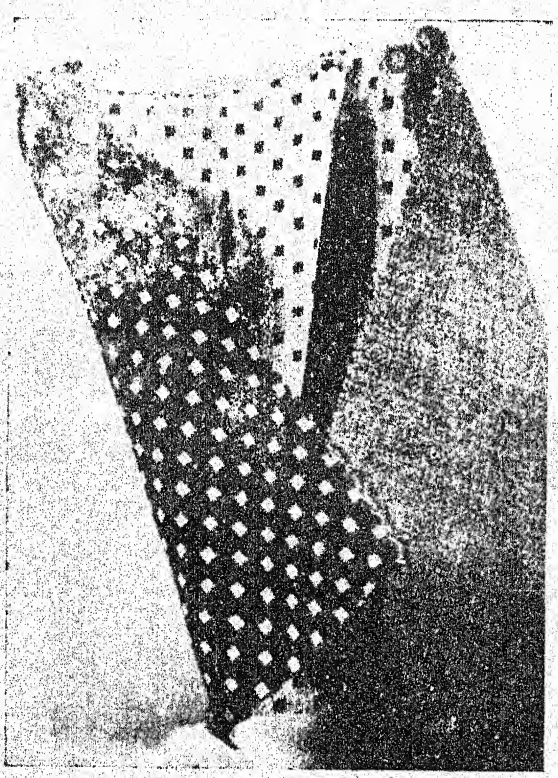


Fig. 24. Mixed fabrics of wool and rayon dyed in one dye bath showing different colour shades.

rods are made to rotate, so that the slubbings keep constantly moving through the dye bath. These are then rinsed and dried.

Skein-dyeing. Yarns of almost all fibres are dyed. Cotton and linen are generally dyed at the yarn stage. But the penetration of colour in skein-dyeing is much better. Skeins of yarns are hung on rods, which are placed in a dye bath. These rods rotate causing the skeins to circulate through the dye bath. This method is known as skein-dyeing.

Piece-dyeing. This is the process used for dyeing materials woven from any fibre. The penetration of colour is not quite so thorough as in the preceding forms of dying. The fabrics are

wrapped around rollers which are placed in the dye bath and left there until they are saturated with the colour. Cotton fabrics need to be held under tension while passing through the dye. The other fabrics are not held taut.

Cross-dyeing. Fabrics woven with mixed yarns, such as cotton, wool, or acetate rayon and viscose rayon, are dyed by this method. The affinity of dye-stuffs differs according to the two kinds of yarns mixed in weaving. Therefore, the fabrics are to be dyed in two successive dyebaths. In one, the dye suitable for one kind of yarn is used and in the other is used the dye suitable for the other yarn. Sometimes, a mixed fabric is dyed in one and the same dye bath and so each one of the yarn takes its own particular and different shade of colour, or one takes the colour and the other remains colourless.

Tie and Dye Process (Fig. 25). This is a form of resist dying, which was practised as far back as the sixteenth century in India

Fig. 25. 'Tie and Dye Process'.

or perhaps even earlier. It is a simple method and yet many fascinating and intricate designs are produced in the fabric, as for example in the famous 'Patola' of Gujrat. By this method either the yarn is dyed before the fabric is woven as in '*Patola*' or the woven material is dyed as in '*Bandani*' saris of Gujrat, Kathiawar and Rajasthan. The parts of the fabric on the yarn which are to resist the dye are tied with strings or narrow strips of cloth. The strings or the strips are waxed to increase the dye-resistance and so get better results. The skeins of the yarn or the material is then dipped in the dye bath. Then these are rinsed, dried and the strings removed. This method of dying produces beautiful patterns.

'*Bandani*' work is used by women in India to dye their saris and scarves or 'dupattas' at home.

Batik. This is another form of resist dyeing which produces patterns like those in prints. This also was first practised in India. The Javanese then took this art to their country, and now 'Batik'-dyeing is a big industry in Java. The method is as follows :

A full sized design is drawn or traced on the material. Hot, melted wax is applied on the lines of the design with a paint brush. The size of the brush depends on the thickness of the lines of the design. After coating the lines with wax, the fabric is immersed in cold water to harden the wax and to wet the fabric. The dye bath is then prepared. Cold water dye or dyes which can be used at low temperature are used for 'Batik' dyeing. If the dye bath is hot, the wax applied on the design will melt and the process will be a failure. The dye-bath vessel must be large enough to allow the entire fabric to be moved freely without any pressure or friction which might cause the wax lines to crack and thus spoil the design. The material is kept in the dye bath long enough for the cloth to be thoroughly impregnated with the dye. The cloth is then rinsed and dried and the wax is removed. A 'Batik' in which more than one colour and an intricate design is used requires very great care and more than one operation is necessary as in the case of multi-coloured prints.

Printing. Printing also was practised in India thousands of years before the Christian Era. The designs were either drawn by a brush or were stamped on the material by wooden blocks carved or cut in relief. A simple method of printing used at first consisted of dipping the carved block in a paste of colour

and then stamping the fabrics with it in a definite pattern. This method is still used extensively. Later, a screen made of fine wires (wire-cloth) or silk bolting cloth came into use. In machine printing engraved copper rollers, or cylinders are used.

The dyes used in printing are the same as those used for dyeing but these are used in the form of pastes. If mordants are necessary, the fabrics are treated with mordant solution before being printed.

Block Printing. (Fig. 26). This is practised in India even to-day to get beautiful patterns. Blocks are made of wood or

Fig. 26. Block Printing.

wood and lino. The design is carved on lino which is generally cut to a thickness of $\frac{1}{4}$ inch. This cut piece of lino is stuck on to a wooden piece of the same size. In India, many printers use only wood blocks on which the design has been carved. The paste of colour is poured on trays lined with cloth. The material to be printed is spread on a padded table and held taut and smooth. Then the block carrying paste of one colour is stamped on the material and allowed to dry. Then another block carrying paste of a different colour is stamped over it to form the multi-coloured patterns. The process is repeated over the entire fabric-surface which is to be printed.

Screen Printing. Silk bolting cloth or wire cloth is stretched

over a wooden frame. Over this, a line is drawn of such portions of the design as are to take one colour. The areas of the screen which are to be used to prevent the spreading over of the colour are filled with water-proof varnish, enamel or some other insoluble filler. The fabric to be printed is then stretched on a table which is padded and covered with oil-cloth. The wooden frame with the screen is then placed on the material, and the paste of colour is brushed over its surface and then lightly pressed. The colour is allowed to dry. Then another frame carrying a different colour and different outline is used and the process continues till the design is complete. A separate screen is required for the application of each colour in the design. The size of the screen used is generally 4 ft. by 6 ft.

Printing by Machines (Fig. 27). A printing machine con-

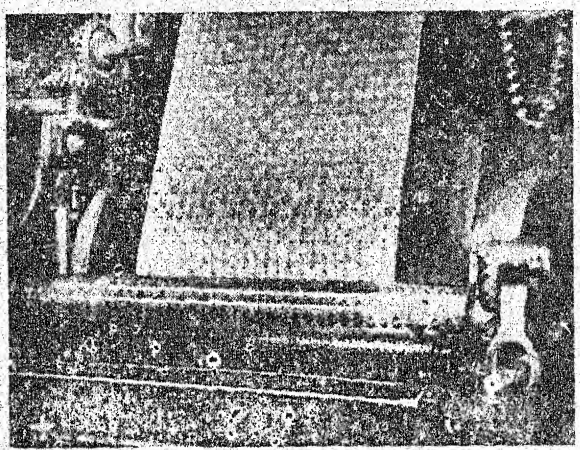


Fig. 27. Machine Printing.

sists of several copper cylinders or rollers which are engraved. The actual printing of the design on the cloth by this method takes very little time but the engraving of the design on the rollers means hard and careful work lasting many days. The roller is as wide as the cloth. The number of rollers required depend on the number of colours used in the design as one roller can print only one colour.

6

Vegetable Fibres

Cotton. India is the acknowledged birth-place of cotton and the original home of the best and finest cotton fabrics produced in the world for thousands of years right up to the 19th century A.D. The cultivation of cotton gradually spread throughout Asia to some parts of Africa and eventually, to the Southern States of U.S.A., which now grow more cotton than the rest of the world. Cotton is the white, downy fibrous substance covering the seed of the cotton plants. The seeds with this covering are encased in pods which grow on the cotton plant and burst open when ripe, disclosing the white, downy covering of the seed now grown into cotton fibres. The cotton plant grown in the tropics needs a climate with six months of summer weather, to blossom and produce the pods.

The cotton fibre is the shortest of all the textile fibres. Its length varies from 8/10 of an inch to 2 inches. Cotton with short length fibres is technically known as 'short staple' and the one with long fibres is called 'long staple'. The latter fibre is valued more as it is used for making the fine qualities of cloth for which it is specially suitable, as it is easy to spin and produces a strong, smooth yarn. It is also suitable for mercerisation.

Gathering of Cotton pods. When the pods burst they are picked from the plants and collected. If left on the plant, the cotton gets discoloured and dirty by exposure to the sun and weather.

Ginning is the process by which the seeds obtained from the pods are separated from the cotton fibres covering them. This process is carried out by means of machinery, and the separated

fibres have now become 'Cotton'.

Baling. The cotton is then pressed into bales which are wrapped with jute sacking and bound with steel bands. The cotton is then supplied to the mills in bales.

Preparation before Spinning. In the mills, the bales are opened and the cotton is pulled out and beaten to remove loose dirt or any other foreign matter loosely present in it. The opened out cotton is then compressed into a sheet called lap.

Carding. The lap on a cotton sheet is passed through a machine called a 'card'. In this machine, the cotton is thoroughly cleaned of all embedded dirt and foreign matter and the matted fibres are separated and laid nearly parallel to each other.

Combing. This is an improved combination of the carding process. In this, all short fibres are elin inated and even long fibres are laid more parallel, thus forming a film like sheet of fibres.

Fibres which are carded and combed are of more even long and smoother than those which are only carded.

Slivering. At the end of the 'carding and combing' processes, the film-like sheet is drawn into a strand about one inch in diameter called the 'Silver', which is collected through a coiler into a can. At this stage, the cotton is ready for spinning.

CHARACTERISTICS OF COTTON

Composition. The cotton fibre is composed chiefly of cellulose which constitutes 88-90 per cent, water 5 to 8 per cent and other natural impurities.

Structure. When raw, the fibre has a tube-like structure containing sap. When the fibre ripens, the sap dries up, the tube collapses and the fibre becomes like a flat, twisted ribbon. A central canal, the lumen runs through the fibre and in ripe cotton it looks like an irregular loop. In dead cotton it is practically absent. Such fibres are weak and brittle. Cotton fibre, therefore, has no lustre or elasticity.

Shrinking. The fibre itself does not shrink but the fabrics made with it which have been stretched in the finishing processes, do.

Effect of Moisture and Friction. It is not affected by moisture or friction and is stronger when moisture content increases. Therefore, it lends itself to the washing process.

Hygroscopic Moisture. Cotton does not hold moisture so well as wool or silk, but absorbs it and so feels damp, much more quickly. It also rapidly spreads over throughout the material.

Heat-Conductivity. Cotton is a better conductor of heat than wool or silk but not as good as rayon.

Affinity to Dyes. Cotton takes in dyes better than linen but not as readily as silk or wool. If a mordant is used, cotton is easy enough to dye. Mordant colours, direct or substantive dyes should be applied to cotton.

Action of Acids and Alkalies. Strong acids will destroy the fibres immediately. Dilute inoganic acids will weaken the fibres and if left dry will rot it. Therefore, after treatment with acidic solutions, cotton articles should be thoroughly rinsed. However they are very little affected by organic acids. They are also quite resistant to alkalies, even strong caustic alkalies at high temperature and pressure.

In 18% NaOH cotton fibres swells, spirals, twists uncoil and shrinks and becomes thicker. The resultant fibre is smoother, lustrous, stronger and has increased water and dye absorption.

Effect of Bleaching. All bleaches can be safely used on white cotton.

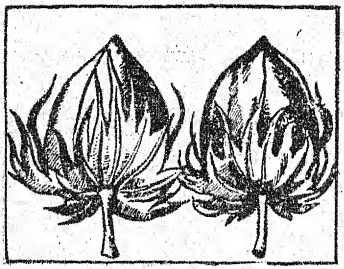
LINEN

Linen is believed to have been used nearly 10,000 years ago by the European Neolithic people. Fragments of the cloth have been discovered in parts of Switzerland, the home of the Neolithic people. In Egypt, the Mummy-cloth or the material wrapped round the preserved dead (mummies) thousands of years ago has been discovered to be linen. Thus, linen has been an important fabric in the past. Even today, a modern housewife is proud of having linen for use in her household.

Linen is the best fibre obtained from the inside of the stems of the flax plant. Flax is grown in moist, temperate climates. Most of the European countries and Egypt cultivate it.

How it is obtained. When the stems of the plant turn yellow at the base, and when the seeds turn from green to pale brown, the plants are pulled out by the roots. Pulling out by the roots gives long, unbroken fibres.

Drying and Rippling. The flax after it has been pulled out is tied up in bundles and left to dry for a few days. The leaves and seeds are then removed from the stems by a process called 'rippling'. This is done by passing the head of the plant through a coarse comb or a machine. Care is taken not to break or injure the stem. After the removal of the leaves and seeds the stems are again tied up in bundles.



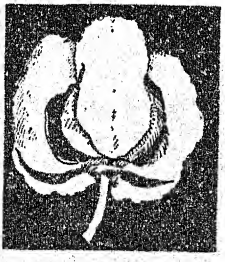


Fig. 28.
Cotton Flowers

Fig. 29.
Carding of
Cotton.

Fig. 30.
Silvers.

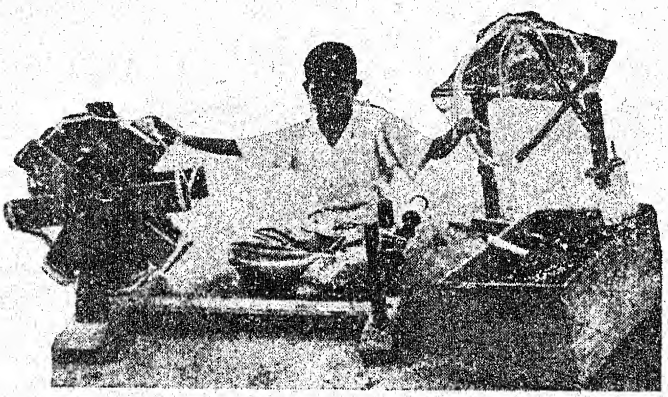


Fig. 31.
Winding of yarn.

Fig. 32.
Takli Spinning.

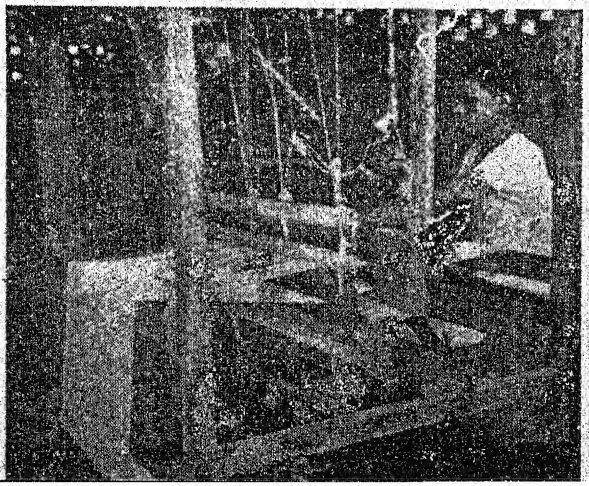


Fig. 33.
Weaving—the last stage.

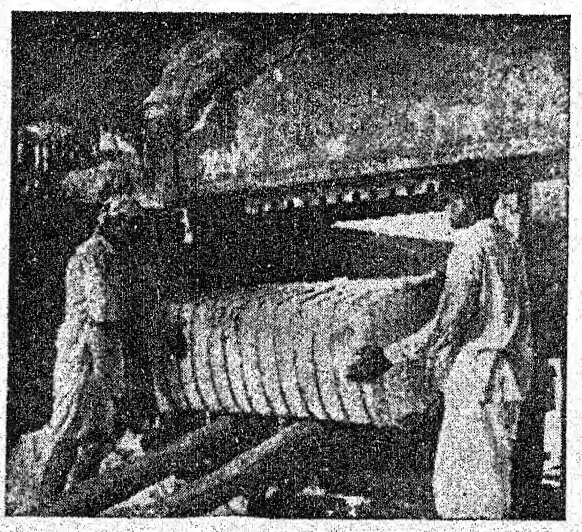


Fig. 34.
Cotton Bale coming out of a press.

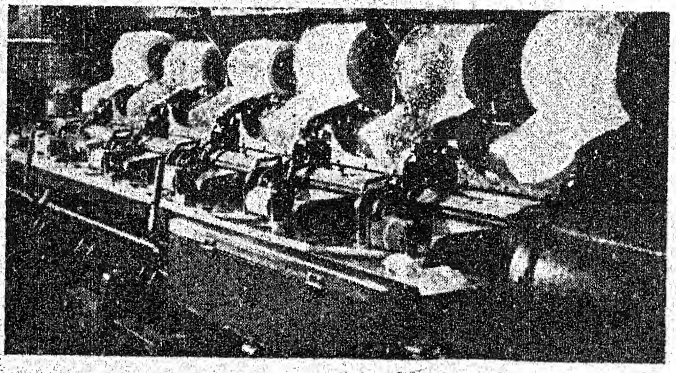


Fig. 35.
Carding in progress.

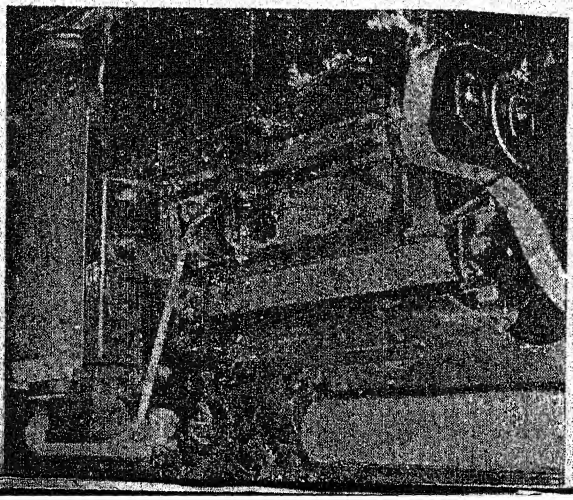


Fig. 36.
Carded Cotton drawn into silvers.

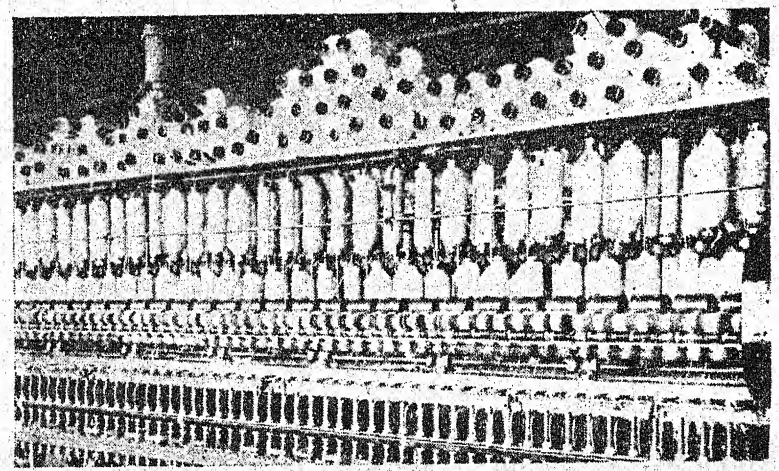


Fig. 37. Spindle loaded with spun yarn.

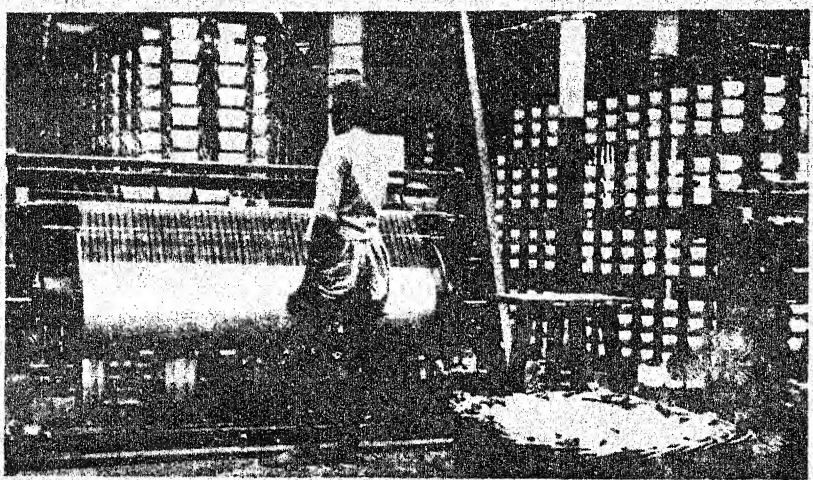


Fig 38. Warping.

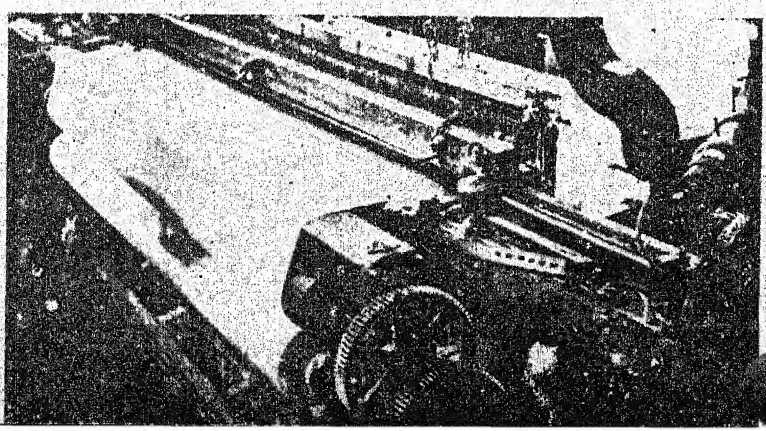


Fig. 39. Weaving of cloth.

Retting. This is the most important process in the preparation of the fibre. In this process, the tissues which enclose the flax fibre, are decomposed by fermentation, and thus, the fibres are separated and freed from the outside woody stalk. The retting has to be very carefully carried out as over-retting will weaken the fibres ; and if the retting is under-done, it will be difficult to separate the fibre from the covering tissues.

There are three methods used for the retting process, *viz.* (*i*) Water retting. (*ii*) Dew retting and (*iii*) Wooden vat retting.

Water Retting. The bundles of stems are kept submerged in running or stagnant water for about two weeks. The best quality of fibre is produced by submersion in cool and slow running water. Swift running water carries away the bacteria and, thus, retards fermentation. The stemp-bundles are covered with straw or sacks and weighed with stones. After about two weeks, the stem ends are tested to find whether the stalk separates easily from the fibre, and if it does, the bundles are taken out of the water and left to dry.

Dew Retting. The stems are spread out in fields and are exposed to rain, sun and dew for several weeks until the stalk begins to separate easily from the fibre.

Wooden Vat Retting. The stems are steeped in water at a temperature of 75° to 90° in a vat until the stems get soft. The stems are then removed from the water, and to loosen the stalk, the fibres are passed through rollers by a method known as 'Pownall's Process'.

Breaking and Scutching. After the stems are perfectly dry, these are passed through a machine to break the outer stalk. Then these are passed through another machine which separates the fibres from the woody stalk, and this process is called scutching. About 12 to 25% of the bulk of the flax is the fibre. The fibres vary in length from ten inches to several feet.

Hackling. It is the final process after which the fibres, laid parallel with one another are ready for spinning. In this process, a series of iron combs, ranging from coarse to fine, are used. The fibres are pulled through the teeth of the comb, beginning with a coarse one. The long, even fibres are used in the spinning yarn for making such fabrics as fine damasks, dress cloth and handkerchiefs. The short fibres, which break off while combing, are collected and used for inferior quality cloth called 'tow linen'

CHARACTERISTICS OF LINEN

Composition. The fibre is composed chiefly of cellulose (66 to 70%) and natural impurities (25 to 30%).

Structure. It is cylindrical in shape, with a thick cell wall, and cross markings at intervals, which are called nodes or joints. It resembles a bamboo. It has a smooth surface and lustre. It is tenacious and can stand hard wear, hence, fabrics made with this fibre are used as bed and table linen and in hot climates for underwear.

Shrinking. Fabrics made with it do not shrink except when they have been stretched in the finishing process.

Effect of Moisture and Friction. Link cotton, it is not affected by moisture or friction and retains its strength when wet. But it cannot stand hot water as cotton does.

Hygroscopic Moisture. It holds more moisture than cotton. Also it absorbs and spreads through the fabrics, and gives up moisture much more readily than cotton. Therefore, linen is a suitable fibre for use as towelling or handkerchiefs.

Heat-conductivity. It is a better conductor of heat than cotton.

Affinity to Dyes. It does not take in dyes as readily as cotton, and, therefore, linen dyeing is rather a difficult process.

Action of Acids and Alkalies. Same as cotton.

Effect of Bleaching. Same as cotton.

OTHER MINOR FIBRES

Jute. This is also a bast fibre of plant 'Cochorous Capsularis' that grows in India, to a height of 12 ft. The fibre is prepared in the same way as flax fibre. These fibres are weaker than linen, are short, lustrous and smooth. Jute is affected by chemical bleaches, and so it is never made pure white. It is used for floor covering, gunny bags, binding threads, and also used for dress materials and saris.

Hemp. This is also a bast fibre stronger than linen, or jute, and is dark brown in colour excepting the Manila hemp, which is white. It is not used for weaving fine cloth but is used for making gauzes, ropes and webbing.

Kapok is a cotton like fibre. It is obtained from a tree grown chiefly in Java, West Indies, Central America and India. The fibre is finer than cotton, is silky in appearance but is not suitable for spinning. It is used only for filling up mattresses and pillows.

Ramie. This is a bast fibre like linen, and is sold as its substitute. It is obtained from a species of nettle plant that grows mostly in Bengal. It also grows in China, Egypt, Java and Japan. The plant grows to a height of 4 to 8 feet. The stalks are cut and water retted, the excessive gum is removed by a chemical. The fibres are combed and straightened. The long fibres are known as 'line', and the short ones are called 'noils'.

Linen fibres are spun and woven into a cloth, which is durable and has crispness which makes it suitable for attractive table linen. Ramie cloth is known as China or Canton Linen.

The noils are used for making canvas *wadding* and cardage.

7

Animal Fibres

WOOL

Origin and Development. Wool, at first, was meant to be the soft hair covering of sheep and camel. Now, its manufacture as a textile fibre includes hair of all kinds of animals provided the hair, either in their natural state or after some sort of treatment, lend themselves for being used for spinning or felting.

It is supposed that wool was used by man as clothing in the very early stages of human history. The primitive man first used the skin of certain animals to protect and to decorate the body. The practice still persists in the form of furs or pelts, which are popular even today. But these were and are obtainable only by killing the animals. Hence, an attempt to increase the supply beyond a certain limit was not only beset with utmost difficulties but was also bound to result, sooner or later, in the extinction of the particular species and the consequent drying up of the supply or resources. Thus, the difficulty of maintaining or increasing supplies adequately to meet the demand led to the search for an alternative covering. Man soon discovered the property of the hair of sheep getting interlocked and matted together under pressure and thus, the hair of sheep came into use for making woollen fabrics. The property of woollen fibres to get interlocked is called 'felting', and the materials prepared in this manner are known as 'felts'. Felts must have been in use for many years until wool was found easy to spin and weave into fabrics.

Almost all countries produce wool, but the quality of wool is not the same. Some countries produce wool of good quality and of fine, soft texture. The famous Kashmir and Kabul 'pashmina' has yet to be surpassed for its soft and fine texture, so also the

Persian carpets have no rivals. In Europe, upto the 13th century, Spain was the only country which produced fine wool known as 'merino' wool. Australia, Africa and America imported the Spanish sheep for breeding and, thus, improved the quality of the wool produced by them. Now, these countries, as well as New Zealand and South America produce good quality merino wool. Australia produces more wool than any other country and that too of a good quality.

Hand-spinning and weaving of wool has been long in existence as a home or cottage industry throughout Central Asia on both sides of the Himalayan range and in China. China leads the world in the supply of carpet wool with India as a close second today.

Woollen Fabrics. Wool fibres of different qualities and lengths are prepared in a special manner to be woven into different kinds of fabrics. For clothing, besides felts, wool fibres are used for the manufacture of two principal classes of fabrics, namely (*i*) worsteds and (*ii*) woollens.

Worsteds are woven from long, tightly twisted fibres of 2 to 8 inches in length. These fabrics are usually woven into a design, or in a twill weave, and are given a smooth finish which brings out the lustre of the fabric, and the design of the weave. These fabrics are lighter in weight than the woollens and as these are woven with fine tightly twisted yarns, are strong enough to be able to stand hard wear.

Woollens on the other hand are soft, fluffy fabrics with napped finish. These are seldom constructed with figure weave. The twill weave is mostly used, as this gives a surface easy for napping. The weaving pattern is, however, indistinct. These fabrics are warmer than worsteds. The short fibre of about two inches in length are used for these fabrics.

Broad cloth and light weighted flannels are examples of fabrics made with worsted yarns for warp and woollen yarn for filling.

Felted Fabrics. Examples of felted fabrics are blankets, rugs and Kashmir 'Pattu'. 'Namdas' (a floor covering manufactured in Kashmir) are made by this process.

PREPARATION OF THE FIBRE

Shearing. Shearing of sheep is the first process. Sheep are mostly shorn in spring months. Formerly, the wool or 'fleece' as it is called at that stage, was clipped from the sheep by hand, but now machinery is used. Fleece shorn from the different parts of the body of the animal is collected and kept separately. Different grades of fleece come from the same sheep. Fleece

from the shoulders and sides of the animal is superior to the fleece from the head and belly. Fleece shorn from living sheep is known as *fleece wool* and that taken from dead animal is called *pulled wool*. Pulled wool is not as good as fleece wool.

Sorting and Scouring. The fleece is first sorted out by experts in grades of soft quality, long fibres and coarse fibres. Then the fleece is boiled in soapy, alkaline solution to remove dirt, grease and dried perspiration. It is then dried in a humid atmosphere to preserve the elasticity and softness.

Carding. For worsted, only long fibres are used, and the process of carding is similar to that of cotton. In this process, the fibres are laid parallel in a film-like sheet like cotton. The film-like sheet is drawn into a silver. The silvers are passed through a combing process in which all the short fibres are eliminated. Then, the silvers are drawn in a fine strand, and this process is called 'roving'. The strand is then wound on a bobbin, and is ready for spinning.

For woollens, the process of carding is different, as the objective is to make the fibres fuzzy enough to allow a nap to be raised. The process is more rapid than that of worsteds ; and the rollers with wire teeth revolve in opposite direction, while for worsteds they revolve in the same direction. Fibres for woollens are only carded and not combed. The carded fibres are drawn into silvers and then into fine strands which are wound round a bobbin or made into skeins ready for spinning.

CHARACTERISTICS OF WOOL

Composition. The chief constituent of the fibre is a protein substance called 'Keratin'. This is the only fibre which contains sulphur.

Structure. (Fig. 40). It has a rod like structure with rough surface of over-lapping horny scales.

Felting and Shrinking. The rough surface or the scales of wool fibre become softened, gelatinous and open out under the influence of heat and moisture, and if pressure is applied, these get interlocked and mat together.

property of the fibre is a

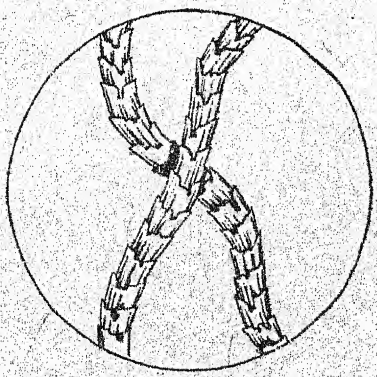


Fig. 40. Microscopic structure of wool.

disadvantage in laundering woollen fabrics, as these shrink or felt, if pressure, heat or moisture is applied.

On the other hand, this property of the fibre is utilized in making felt fabrics directly from fibres without spinning or weaving them. The cleaned fibres are just subjected to pressure in moist heat to form the fabric.

Effect of friction. Friction will soften the fibre, specially when wet.

Hygroscopic Moisture. Wool is considered the most hygroscopic of all the fibres. It absorbs moisture without feeling cold or clammy from the atmosphere and holds as much as 30 per cent of its weight without feeling wet to the touch.

Heat conductivity. Wool fibre is a poor conductor of heat, and, therefore, the fabrics made of this fibre are suitable for winter for wear and cold climates.

Affinity to Dyes. Wool fibre has a great affinity for most of the dyes, specially for acid and basic dyes.

Action of Alkalies and Acids. Alkalies have a harmful effect on wool. It makes the fabric yellow, hard and causes felting. However, borax and ammonia have no harmful effect on wool and, therefore, when steeping becomes necessary, these two alkalies are used.

Concentrated acids will weaken and destroy the fibre, but dilute solutions have no harmful effect.

Bleaching. Strong bleaching agents specially sodium hypochlorite (Javelle water), have a harmful effect on wood. Potassium permanganate, sodium peroxide and hydrogen peroxide are used for bleaching and strain removal. Wool fabrics gain with the body's movements ; they are more comfortable to wear than less resistant materials. Wool is flame resistant, however it is subject to moth damage unless specially treated.

SILK

Origin and Development. Silk is the secretion of the silk worm. The cultivation, collection, spinning and weaving of silk is an ancient art, which had its origin in China thousands of years ago. According to the Chinese legend, it was the Empress Si-ling-chi, who had first reared silk worms, and had collected and spun silk thread. She made a robe of the silk thread and presented it to her husband the Emperor Huango-to, who ruled about 2700 B.C. The Empress, later on, shared her knowledge

of silk-making with others and thus the silk industry was born in China. The Chinese call Si-ling-chi the Goddess of Silk.

The Chinese kept the knowledge of the industry to themselves for nearly 3000 years and then round about 289 A.D., Japan and India acquired it and became experts in the art of silk making. From India in about 555 A.D. the knowledge and art of silk growing and making silk fabrics travelled to Persia, Central Asia and Sicily. The Western countries took to the industry much later than the Asiatic countries.

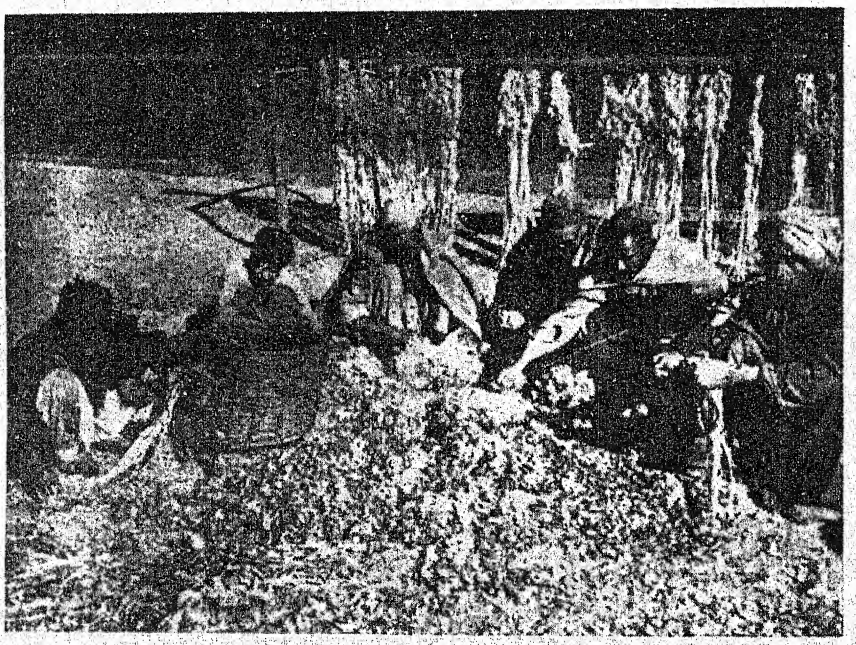


Fig. 41. Collecting waste silk.

In India, the chief silk producing centres are Kashmir, Bengal, Mysore and Madras.

Preparation of Silk and its Yarn. Silk, as already mentioned, is the secretion of the silk-worm and, therefore, production and the preparation of the fibres from the raw material is basically different from cotton, wool or linen. The preparation of the silk fibre is produced by what is known as 'Sericulture', which is carried out in stages before the silk is reeled off from the cocoons.

The Cultivation of the Mulberry Trees. Silk-worms live

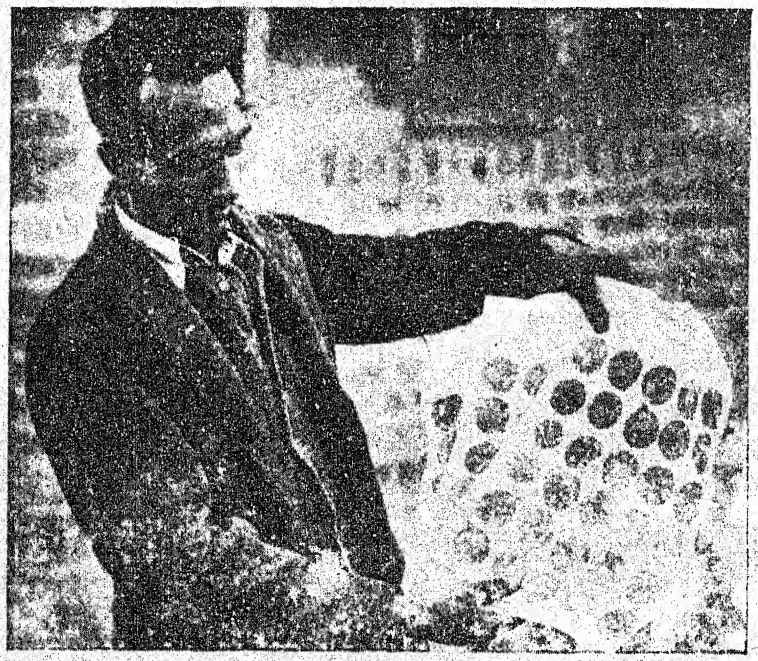


Fig. 42. Silkworm Eggs.

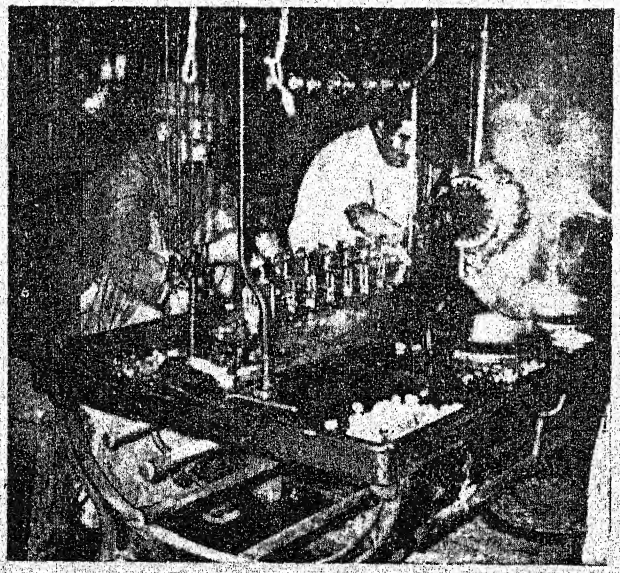


Fig. 43. Boiling of Cocoons.

Fig. 44. Spinning of Silk Yarn.

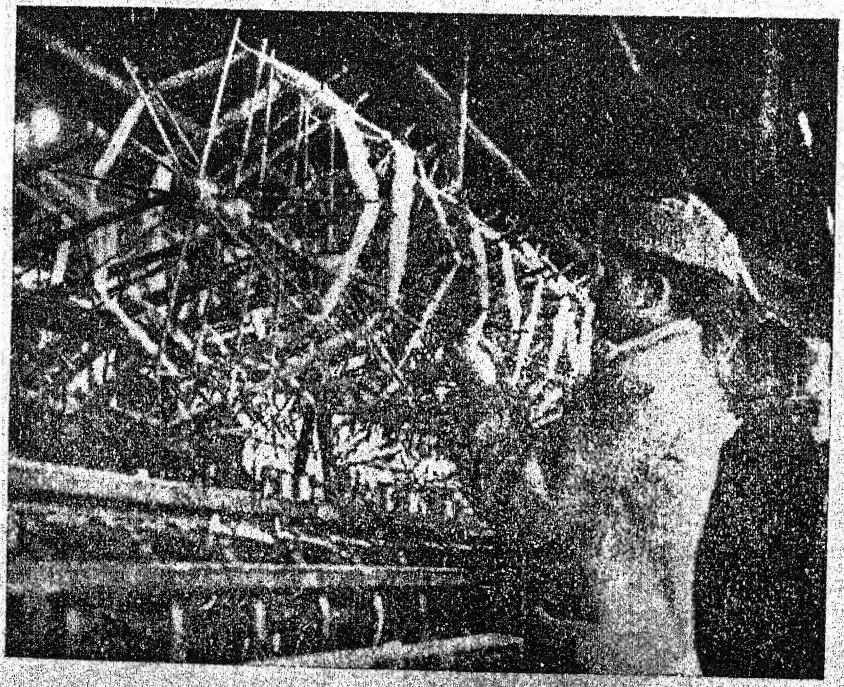


Fig. 45. Winding of the Yarn.

on mulberry leaves, and therefore, for rearing them, the growing of mulberry trees is the first essential step. These are grown by the usual agricultural methods.

The Rearing of Silk-Worms. This by itself is in many places a cottage industry and is carried on by agriculturists, who grow mulberry trees. Silk-worms have a short life of only about two months, during which these pass through four stages, namely :—

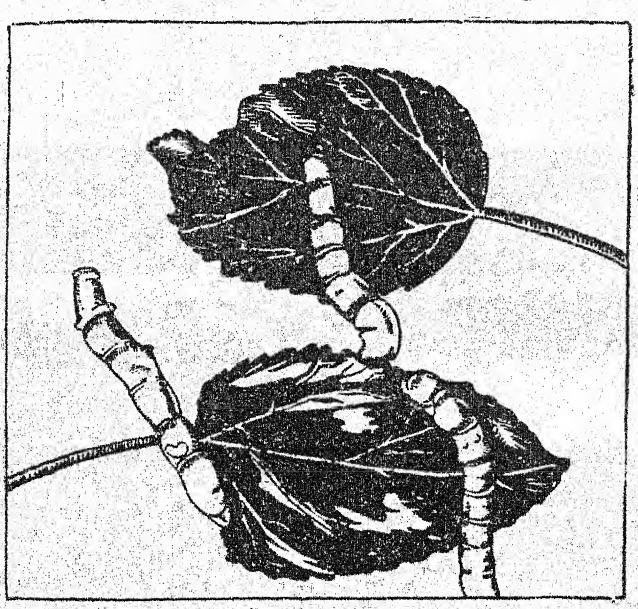


Fig. 46. Silk worms on mulberry leaves.

(*i*) Eggs, (*ii*) Worm (larvae), (*iii*) Chrysalis or Pupa and (*iv*) Moth. To get silk in long strands, the worm is killed at about the end of the Pupa stage, otherwise, in emerging from the cocoon as a moth, it will break the silk fibre into small unusable pieces. A few worms are, however, spared to grow into moths for laying eggs. The moth is made to lay eggs on sheet of paper. The eggs are then storted in cold storage for six weeks. The sheets with the eggs on them are washed in hot water and left to dry indoors.

The eggs take ten days to hatch. Even temperature, good ventilation and exclusion of dampness and hot sunlight are the necessary conditions for satisfactory hatching. In the second stage, the young worms, on hatching out, are fed on finely cut mulberry leaves for ten days. At this stage, the worm needs special care. Bamboo trays covered with straw mats are pro-

vided for them. The worm passes through five progressive periods and at the end of each period casts off the skin and grows bigger and bigger. At the end of the fourth period of the worm, it moves round its own body forming a figure of eight and in that position spins its cocoon from its secretion. The secretion is a gummy fluid secreted from two glands in its head which oozes out through a single opening. This fluid gets hardened when exposed to air, thus forming long fibres. The worm covers itself with this. When this process of the cocoon is completed, the worm sleeps for ten to fifteen days and turns into a pupa, the third stage of its life cycle. At this stage, the cocoons are collected and are dipped in boiling water or steamed to suffocate and kill the pupa inside. Then the cocoons are dried and stored.

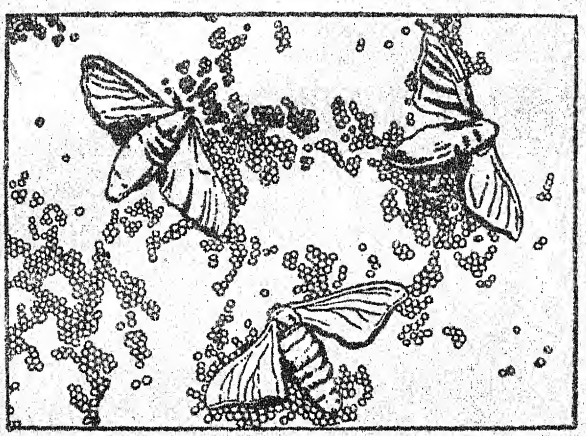


Fig. 47. Silk Moth and the Eggs.

Note. There are two varieties of silk-worms, *viz.*, (*i*) wild or Tussar and (*ii*) cultivated. Fibres of the Wild Silk-worm are brown and have a coarse and hard texture, as compared to the silk fibre from cultivated worms. The silk from wild worms is known as Tussar silk. In India, it is produced in Bihar, Orissa, Madhya Pradesh and Uttar Pradesh.

Reeling. Cocoons are placed in warm water to soften the silk. Fibres are pulled out from several cocoons and are grouped together. These are then passed through a small hole in the reeling frame and then twisted and passed through another hole and again twisted on. The process of twisting continues until a strong thread or yarn is obtained. This is then wound or reeled round spools or in skeins. The skeins or spools are then sent for weaving. After the cloth is woven, it is boiled to remove

the excess of natural gum, and this process is called *degumming of silk*.

The short fibres, which are unfit for reeling are collected, boiled to remove gum, and then dried. These are combed and made to run parallel and are then drawn in film-like sheets, as for cotton fibres. The film-like sheets are passed through several rollers. Then the fibres are passed through a spinning frame. This process is called rowing and gives twist to the fibres and forms yarn. Silk fabrics made from this yarn are known as 'spun silk'. Velvets, satin and silk broad cloth are usually woven from spun silk yarn.

Fig. 48. Degumming of silk.

CHARACTERISTICS OF SILK

Composition. The chief constituents are fibrion, the protein substance and sericin the silk-gum.

Structure. Silk fibre has a double rod-like structure, which is more or less flat in Tussar silk. It is covered with lumps of gum.

Effect of Moisture and Friction. The fibre is not affected by moisture. It does not shrink or stretch when wet. Friction may spoil the smooth, soft texture of the fibre and, therefore, it is avoided in washing silk fabrics.

Hygroscopic Moisture. Silk fibre absorbs 10 to 30 per cent of moisture without feeling wet to the touch, but it does not allow the moisture to spread very readily.

Heat conductivity. Silk is a bad conductor of heat and, therefore, is warmer than cotton, linen or rayon.

Affinity to Dyes. This fibre has a great affinity to dye-stuffs. Acid, basic and direct dyes are used for dyeing silk.

Effects of Alkalies and Acids. Strong alkalies have a harmful effect on silk but weak alkalies; such as borax or ammonia can be safely used, when necessary, in steeping or stain removal.

Dilute acids do not damage silk but strong acids will dissolve it.

Bleaches. Hypochlorite, *i.e.*, javelle water has a harmful effect on silk and should never be used. Other mild oxidizing bleaches, such as hydrogen peroxide, and potassium permanganate may be used.

8

Synthetic Fibres

The synthetic fibre industry has made fantastic progress in the past fifty years. As early as 1884 Count Hilaire Chardonnet made a fibre which resembled silk, from nitrocellulose by dissolving it in ether. The first truly man-synthesized fibre, nylon was produced in 1938.

All man-made fibres have some processes in common. They have been produced from non-fibrous materials or if fibrous material were used originally, then they have lost their fibrous structure during processing. This is done by forcing the solutions through spinnerets. These fibres are then allowed to harden during a specific time and then are wound on bobbins or cones or they are deposited in "pots" as cakes of yarn.

Man-made fibres are divided into two major classifications—non-thermoplastic and thermoplastic.

The non-thermoplastic groups of man-made fibres have several origins, *e.g.*, cellulosic, alginates, minerals and protein base fibres. Except for the mineral-based fibres, these non-thermoplastic fibres can be cared for as cotton, silk, wool whichever they resemble most in their physical and chemical reactions. Heat will not melt them but they scorch easily at high temperatures. They are soft, absorbent, comfortable to wear, do not discharge static electricity and are mothproof. Like all other man-made fibres, under the microscope they appear as smooth rods, with black specks, as if they are delustered. None of these fibres can be positively identified in longitudinal sections by the microscope.

The first thermoplastic fibre to be made was acetate followed by nylon. Now besides the acetates and nylons, there are acrylics, modaacrylics, nefrils, olefins etc.

These thermoplastic fibres react very quickly to heat. They soften and become pliable. This softening point varies with different fibres. When these fibres are at the softened stage, they can be shaped, pleated or embossed.

These fibres, like other man-made fibres, must be stretched to orient the molecules in order to increase fibre strength, their tenacity, or to give them dimensional stability. Nylon is usually heat set to stabilize the twist of yarn, to remove shrinkage, to increase wrinkle resistance, to set the grain in the fabrics, or to make washable pleats.

These thermoplastic fibres have a number of properties in common. Their hygroscopicity is low. Therefore they are uncomfortable in hot humid weather. They are washed easily and dry quickly. Water soluble stains are removed easily but not grease or oil. Most of these fibres accommodate charges of static electricity. They are mostly wrinkle resistant.

A microscopic examination reveals that they have the same longitudinal appearance as other man-made fibres. But their cross-sections vary and they can be identified with these.

NON-THERMOPLASTIC FIBRES

THE RAYONS

Rayon is an artificial, synthetic fibre made from cellulose.

Origin and Early History. The rayon fabrics were at first called 'artificial silks', as these resembled the natural silk in appearance. As recently as 1924, the name 'rayon' was given to these fabrics. The rayons produced then were very lustrous, and, therefore, the name which means 'reflecting the sun's rays', is considered more suitable.

Although rayon fabrics have been commercially available for little more than fifty years, the idea of making such fabrics dated back to 1664 A.D. Robert Hook, an English Naturalist, prophesied in that year that a way would be found to make an artificial fibre which will resemble natural silk. Then two centuries later, in 1884 Count Hilaire Chardonnet made a fibre which resembled silk, from nitrocellulose by dissolving it in ether, and produced it on a commercial scale. Count Chardonnet is, therefore, considered the father of rayon fibre and the rayon

industry. But the production of rayons did not make much progress. In the beginning of this century, U.K., Switzerland, Belgium, Austria, Germany and U.S.A. started making rayons. Since then much experimental and research work has been done to improve the process, as well as the quality of the yarn, during the course of which many processes were discovered and perfected. These are known as (*i*) the viscose process, (*ii*) the cuprammonium process and (*iii*) the cellulose acetate process. Now all these processes are more in use than the one discovered by Chardonnet which is much more expensive.

India has been importing rayon fabrics as well as rayon yarn. Since 1942, however, the Board of Scientific and Industrial Research has been making efforts for starting factories for making rayon yarn and many a plants have been set up since then. Bamboo, and Bagasse—cellulose from sugarcane a bye-product of the sugar industry—is used for making rayons in India.

Principles of making Rayons. Rayon, as mentioned above, is made from cellulose by any one of the former specified processes, but the important steps in each of these are :

(*i*) to treat cellulose chemically for making and rendering it a liquid, (*ii*) to force the liquid through fine holes, and (*iii*) to change the liquid stream into solid cellulose filaments.

The Nitrocellulose (or Chardonnet) Process. In this, cotton is reduced to nitrocellulose by treating cotton with sulphuric and nitric acids. This gives an inflammable material. This material is dissolved in ether and the fluid thus formed is forced through tiny holes, into air. The ether evaporates and a fine thread is obtained, which is treated with sodium hydrosulphide to render it non-inflammable.

The Viscose Process. This process was discovered in 1892, but the yarn was commercially produced a few years later. In this process spruce chips are used. These are first bleached, and then steeped in caustic soda to form alkali cellulose. It is treated with carbon bi-sulphide to form cellulose xanthate and is dissolved in dilute caustic soda solution. This is filtered and kept for ageing until a thick fluid is formed, which is known as viscose. This fluid is forced through fine jets into a coagulating solution of dilute sulphuric acid, which regenerates the cellulose into a continuous fibre.

This process is largely used in the manufacture of rayons.

If a dull appearance is desired, a small proportion of a white opaque pigment (usually titanium dioxide) is added to the viscose solution.

The Cuprammonium Process. This process has been used since 1897. In this process, cotton linters are used. These are first boiled in soda and soda-ash, and then are bleached with chlorine. These are dissolved in a solution of copper sulphate and ammonium hydroxide. The liquid is left for ageing or ripening. This is then passed through fine jets into a solution of dilute acid when it is turned into regenerated cellulose filament. This filament is stretched to form a fine thread.

Cellulose Acetate. This process has been commercially developed since 1918 although the process was discovered half a century earlier in 1869.

In this process, cotton linters are treated with a solution of acetic anhydride and acetic acid. The acetic acid combines with cellulose to form cellulose acetate. This is kept for ageing until it has ripened. The ripened product is washed with cold water when the cellulose acetate separates into white flakes. The flakes are dissolved in acetone and filtered. This solution is then forced through fine holes in hot air. The acetone evaporates and leaves a fine fibre of cellulose acetate.

Note : Rayons are classified into two groups, namely : (*i*) Regenerated Rayons or those produced by the first three processes mentioned above and (*ii*) Cellulose Acetate or that produced by the fourth process. The last mentioned differs in its properties from the other three as it is not pure cellulose but cellulose combined with acetic acid.

Spinning of Rayon Yarn. The cellulose solution is passed through the spinnerets into a coagulating medium, in which the fibres get hardened. Several fibres are twisted together to form a yarn. The yarn then is wound on spools ; winding and rewinding is repeated using two spools and each time giving a twist to the yarn. Then, finally, the yarn is would into skeins.

CHARACTERISTICS OF RAYON

Effect of Moisture and Friction. Regenerated rayons loose strength when wet but cellulose acetate is not as much affected in that respect by moisture. On drying, all of them regain their strength. Friction will weaken and spoil the lustre of the fibre, specially when wet.

Heat Conductivity. They are good conductors of heat.

Hygroscopic Moisture. Rayon fabrics absorb more moisture

STAGES IN RAYON MANUFACTURE

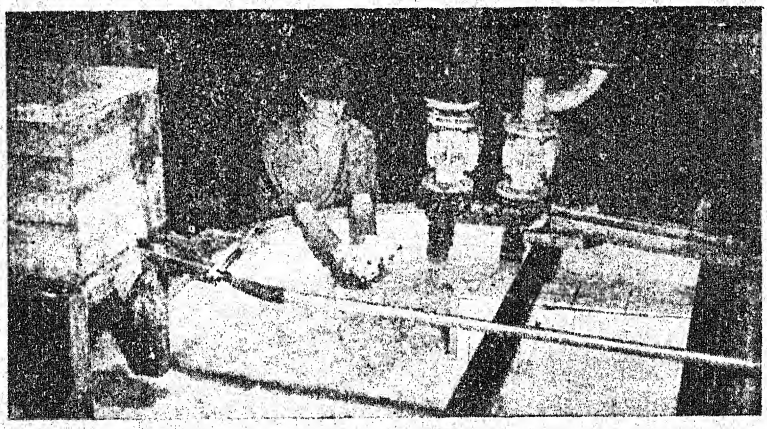


Fig. 49. Bleaching and washing of the cotton linters.

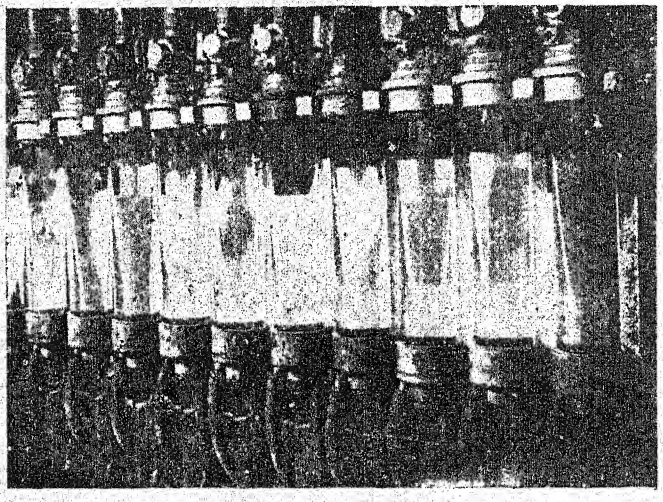


Fig. 50. Streams of fine filaments issuing from the spinning nozzles into the spinning funnels where coagulation takes place.

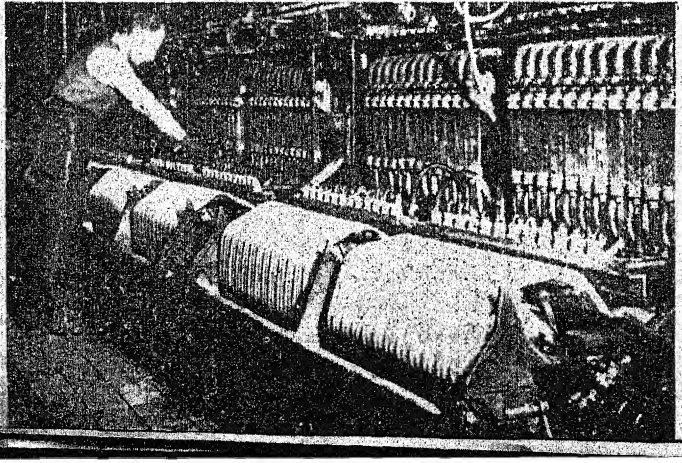


Fig. 51. The filaments are stretched and many filaments are twisted together to make one yarn. Each funnel produces one strand of yarn.

than cotton or linen but do not give out moisture as readily as those two fabrics.

Effect of Heat. Heat affects them. Cellulose acetate rayon melts and fuses by the application of heat. The viscose and cuprammonium fibres are not greatly affected by heat, and the delustered effect given to these fabrics by heat can be diminished by the application of heat and moisture together as this will bring back the lustre.

Action of Acids and Alkalies. All rayons are weakened even by dilute solution of acids. Cellulose acetate dissolves in acetate acid and formic acid. Alkalies also have harmful effect on rayons.

Effect of Acetone. Cellulose acetate dissolves in acetone, but not the other rayon.

Affinity to Dyes. The viscose and cuprammonium fibres have great affinity for dyes used for cotton and linen, but the cellulose acetate rayon does not react to the same dyes. Rayons generally take dye-stuffs readily.

Action of Bleaches. Reducing bleaches may be used in cold, dilute solutions. Oxidizing bleaches will damage the fibre if these are not used with great care.

Durability of Rayon. Spun rayon made from small fibres is not so strong, but rayon fabrics made from long fibres are quite strong, though not quite as durable as pure silk, cotton or linen. They are, however, generally more durable than weighted silk.

Elasticity. Rayon does not have natural elasticity and, therefore, rayon clothes frail at the elbows, knees and the seams. Rayon requires greater allowance for seams. It is also important to have even tension and length of the stitches to avoid slipping.

There are a number of non-thermoplastic fibres besides nylon, the foreign market. Some of them are avril, zantrel, qulin, Fortisan, Cornal, Tikel. The processes used for the new fibres have not been published, but their preparation are known. Compared to regular rayons they have improved dimension stability, better wet stability and they have lower power of elongation.

THE THERMOPLASTIC FIBRES

NYLON

Nylon was the fibre first to be synthesized from materials none of which had previously been fibrous in nature.

History The history of nylon dates back to 1928, when

Dr. Stine, the Chemical Director of du Pont Company prevailed upon the Company to start research work relating to new fibres. The research continued for some time and experiments were made on cellulose derivations, particularly the esters and new types of esters, and also on certain nitrogen containing derivatives of cellulose. These experiments were not successful. Dr. Wallace H. Cenothen, at the same time made a study of poly-condensation whereby linear-polymers are produced, and this eventually led to the invention of nylon. In 1938, du Pont Company started a plant for nylon production. This fibre was known as fibre 66. Later, the name nylon was given to it.

THE PROCESS OF MAKING NYLON

Although it is often stated that nylon is made of coal, air and water, the actual synthesis is entirely different. Nylon 66 is produced from an acid and a diamine, which are produced from coal-tar derivatives. A mixture of two coal-tar products, a dibasic acid, adipic acid, and hexamethylene diamine containing nitrogen is heated to give a condensed product known as nylon polymer. The process is explained diagrammatically on page 77. Since each of the above compounds have six carbon atoms, the finished fibre made from this was known as Fibre 66.

The nylon polymer is melted and passed on chilled rollers when it comes out in the form of rolls, these are then cut into chips and stored.

The chips are remelted and filtered through special filter packs.

After filtering, the molten polymer is passed through the tiny holes of a metal disc called a spinneret and fine filaments are thrown out into air where these get hardened. These are then passed through a conditioner which moistens them so that a number of these filaments stick together to form a long thread which is wound on a reel.

In order to increase the tensile strength and elasticity in the fibre, the filaments are drawn to about four times their original length by the application of force. During this operation the diameter of the fibre is reduced.

Twisting of the yarn is also carried on at the same time by the use of suitable equipment for the purpose.

PROPERTIES OF NYLON

Nylon is a lustrous white transparent fibre and is both tough and pliable. Absorbency is low and this makes it a quick drying

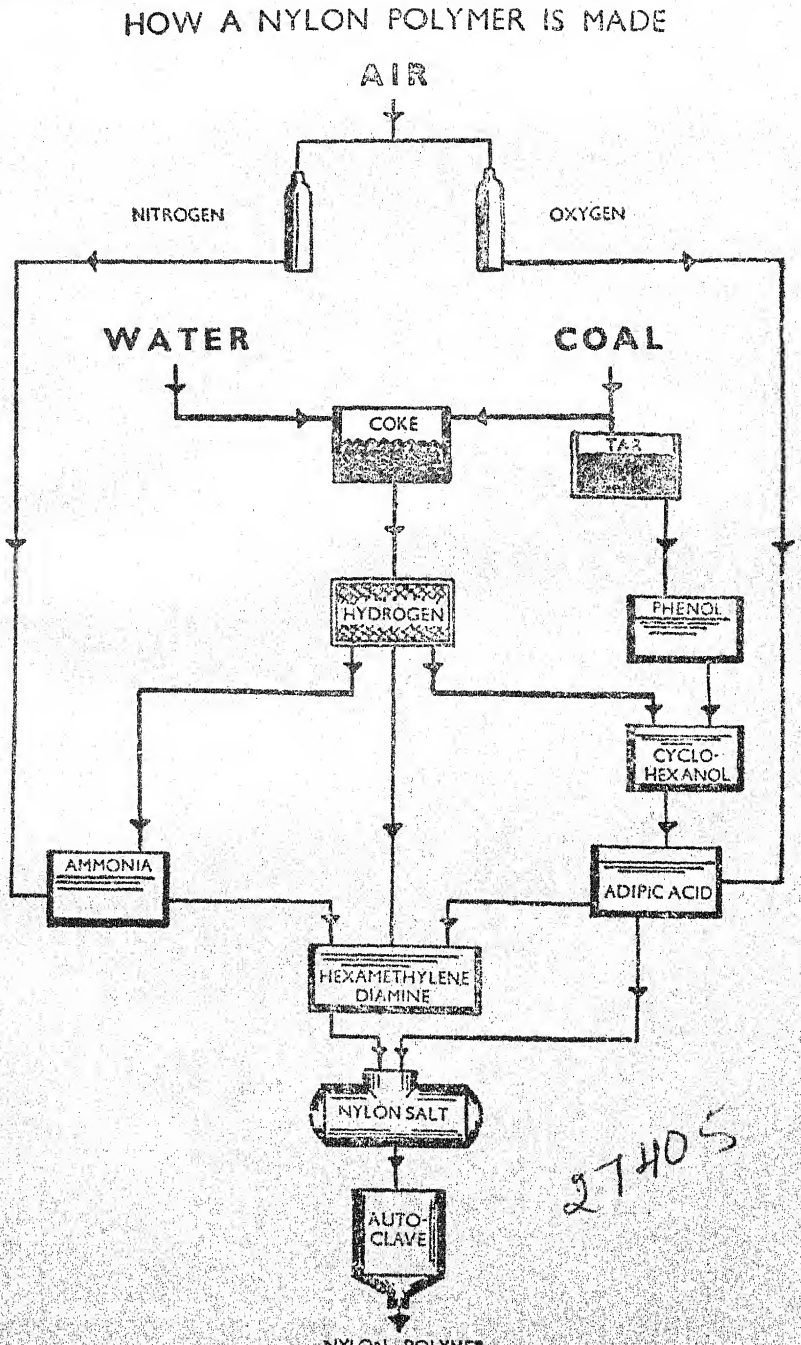


Fig. 52. How Nylon Polymer is made.

HOW A NYLON YARN IS MADE

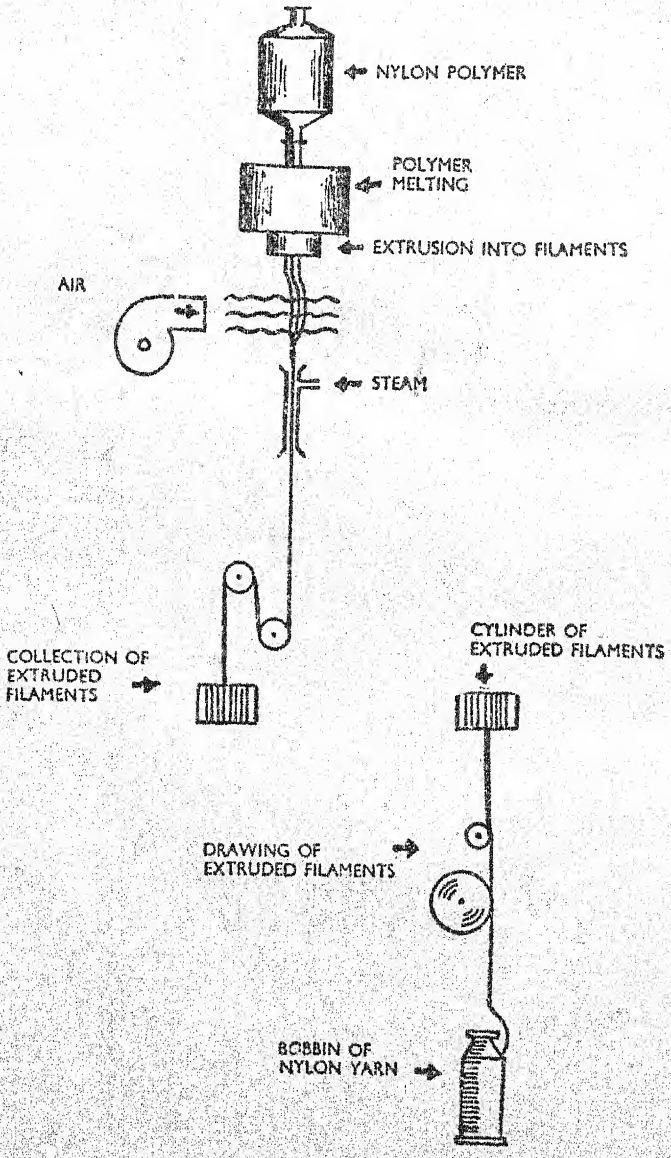


Fig. 53. How a Nylon Yarn is made.

and easily washable fibre. Although it does not stain readily it tends to pick up colour, grease and soil if laundered with other garments.

It is not affected by cold temperatures but looses strength and yellows at sustained high temperatures. Pressing temperature of 24°F is considered safe for nylon.

It has good wrinkle resistance and crease recovery. It has very good abrasion resistance and is considered a very durable fibre. It is degraded by exposure to light. It is not chemically reactive to soap, alkalies or alcohol but reacts readily to acid. Bleaches do not affect it and so are ineffectual for whitening discoloured nylon.

They can be dyed and usually the colours are permanent. They are sometimes resin treated to stabilize the weave, silicone treated to improve softness or water-repellancy but because of their low absorbency they do not accept finishes readily.

TERRYLENE OR DACRON

The work of Carothers paved the way for many other textile materials. Terrylene is one of these. Whinfield and Dickson patented the method for making terrylene using teraphalic acid and ethylene glycol. This acid and alcohol are polymerized in vacuum at a high temperature and the polymer is extended in the form of a ribbon. The ribbons of polymer are then cut into small chips and the polymers (molten) are passed through spinnerettes with circular perforations.

The du Pont Company purchased patent rights of this fibre in the United States, and with some modifications in processing, put Dacron as a new fibre on the market in 1953. Dacron and terrylene are essentially the same fibre.

The most outstanding properties of this fibre are its excellent resistance to wrinkling and creasing, both when dry and wet. It has good abrasion resistance, toughness, resilience, elasticity and stretch resistance. Dacron has a property known as 'wicking'. Wicking is the ability of a fabric or fibre to pick up moisture and allow it to travel along the fibre, without actually absorbing it. Thus dacron is comfortable to wear in hot weather.

Dacron melts and drops when exposed to fibre. It is self-extinguishing and does not flash burn. It has good resistance to weak acids and alkalies but is disintegrated by concentrated sulphuric acid. Dry cleaning solvents and bleaches do not effect

this fibre. It is difficult to dye but can be satisfactorily coloured with acetate dyes.

MATERIALS BASED ON NATURAL PROTEINS

(*a*) *Ardil*: The raw material for the manufacture of ardil are the proteins, arachin and conarchin which can be obtained from groundnuts. It is a result of the research carried by Imperial Chemical Industry (I.C.I.).

(*b*) *Fibrolane*: In principle the manufacture of fibrolane is similar to that of ardil, the main difference being that casein from milk is used instead of groundnut protein. People will be surprised if they are told that the suits they are wearing are of milk instead of silk.

MINERAL FIBRES

Three minerals are used in textiles fibre making; asbestos—a natural fibre; glass fibre and metallics—a man-made fibre.

ASBESTOS

Asbestos is a naturally occurring mineral fibre. It is fibrous rock and is famous for its non-burning qualities. Under the microscope the fibres appear straight, smooth and needle-shaped. It does not burn or melt but short periods of high temperatures will decrease its strength. It is absorbent and has wicking ability. It is acid and alkali resistance and this makes it specially desirable in the use of filters for chemicals and in industries where chemicals are used. Flameproof clothing for industrial and military purposes are also made from asbestos. It is used for all types of fire fighting equipment and insulation for steam pipes, brakes, and hundreds of other items where non-combustibility is essential.

GLASS

'Fibreglas' is the trade mark for the glass fibre produced by the Owens-Corning Fiberglas Corporation of America and is the only Glass fibre about which information is available. Glass fibres are inorganic polymers based on silicon rather than carbon.

These fibres have not become very popular as they are subject to severe abrasion and cut each other if they rub together. They are used for curtains and drapery fabrics because of their attractive appearance, non-combustibility and are resistant to light deterioration.

They are not suitable for wearing apparel as the ends of these fibres irritate the skin, they are heavy and non-absorbent.

Much of the glass fibre is used for insulation in buildings and for insulating electrical and other industrial equipment.

METALLICS

Metallics are defined as "a manufactured fibre composed of metal, plastic-coated metal, metal-coated plastic, or a core completely covered by metal."

They are yarns and not fibres, but they are considered in fibre groupings because they replace fibres for textiles purposes. Gold and silver have long been used in India in textile fabrics. Aluminium and copper have a more recent origin. Metallics were used to add richness, glamour and glitter to fabrics. Modern metallic fibres, with aluminium as the basic metal, are much cheaper, softer and lighter in weight. But because they are no more rich and luxurious and look cheap this may lead to their rejection.

9

Some Traditional Textiles of India

The India of today succeeded to a rich heritage in Architecture, Music and other Fine Arts and Crafts, which for scores of centuries had been steadily growing despite the rise and fall in the destinies of its people.

Aliens who came, whether as traders or as invaders, ended with the solitary exception of the English—by making India their home and by getting absorbed in its original inhabitants. The intermingling of races did start new currents and cross currents in the flow of our culture, but it made our culture richer and fuller.

The culture, India invariably shared with its neighbours and others, thereby earning for itself an honoured place—second to none—amongst the nations of the world. Its fame spread to lands far and near, even in those remote ages of which no written historical record exists. Whilst the missionary zeal of our religious emissaries carried the spiritual aspects of our culture to the distant corners of the globe, the spread of our culture on its temporal side was entirely due to our traders and exporters who were our cultural ambassadors abroad. Through the export of its famous textiles the exquisite beauty and fineness of which was almost legendary, ancient and medieval India attained an unrivalled position in the international textile trade, which she maintained till not-so-very-long ago. According to George Birdwood, India "was probably the first of all countries that perfected weaving and the art of its gold brocades and filmy muslins". Can it be wondered then that the textile products of the Indian carftsmen were eagerly and even anxiously looked for

and awaited in the markets of the world ? How could competitors ever hope to catch up with a country that was thousands of years ahead of them in this art ? They could only ban the use of the Indian fabrics within their own country. The Roman Senate was probably the first to pass a law (about 1600 A.D.) prohibiting the wearing of the Indian silk garments by men. A little more than a century later England prohibited by law the use of the Indian calico. This was the beginning of the two-centuries-long unremitting war against India's supremacy in textiles.

As is only natural, a crop of legends has collected around the fineness and the delicacy of the fabrics which the Indian weavers produced with the aid of little more than bare human hands. One such, which is widely believed to be authentic, might be related here. The austere Mughal Emperor Aurangzeb chided his gifted daughter Zebunnisan, for not being properly dressed because her body could be seen through. "But I have no less than seven suits on" protested the lady "one on top of another." "Put on some more then" commanded the Emperor "to obscure the transparency."

As in Architecture, Music and other Fine Arts, India has its own distinctive contribution in the production of textiles so far as artistic designs, harmonious and beautiful colour schemes and, of course, the fineness of the fabrics are concerned. Hand spinning and weaving though carried on a small scale and developed slowly as a cottage industry had yet reached a high stage of perfection, even as early as 327 B.C. We catch glimpses of it in the descriptions, sent home by Alexander's soldiers, of the costumes worn by the people of India. Foreign visitors to this country, on their departure, always carried away with them, as priceless treasures, pieces of silks, brocades and muslins. Cargoes, laden with our wondrous fabrics, were invariably welcomed by other countries. This marvellous technique of the craft which has raised it to the status of a 'Fine Art' has developed through hundreds of generations of craftsmen who formed an exclusive class or guild and handed down from father to son, the knowledge gained and the progress made so that each successive generation of craftsmen added something to it and became more and more efficient, producing better and yet better results. Another characteristic of traditional Indian textiles common to all artistic creations of human hands is that, each piece bears the stamp of the individuality of the craftsmen who produced it. Thus, it has a human interest of its own. As the gifted

writer Shm. Kamla Dongerkery has said, the traditional textiles of India "reveal the background of rich culture, they give artistic shape and form to the ideas and ideals which inspire the lives of the people" and thus provide one of the most reliable hallmarks of the cultural development of the people.

The craft was carried on in the villages of some of the important provinces of India, especially around the coastal towns and cities. It was not restricted, as a profession, only to men alone, but women too, in their own leisure hours, helped their men in spinning and weaving and thus, added to the family income. Indeed, in certain provinces like Assam, tradition required women to achieve some degree of skill in the arts of weaving and spinning and even today unmarried girls in Assam are not considered quite eligible for matrimony, unless they have acquired some grounding in this useful art. But the craft flourished mostly as a result of the patronage extended to it by the royalty and aristocracy, which played a vital role in its development. To suit the tastes of the royal and noble families, the standard of production had necessarily to be very high and ever progressive.

Different types and varieties of textiles were produced in different parts of India and thus we hear of Benaras and Surat Brocades, Dacca Muslins, Cashmere Shawls, Gujrat Patolas and Bandhanis, each famous for its design, quality and colour. In the following pages, an attempt has been made to present, in bare outlines, the chief characteristics of some of the outstanding traditional textiles of India. Illustrations of several of these fabrics have been added to their descriptions.

It would perhaps interest our readers to learn that in a number of ancient families are cherished, even today, as valuable heirlooms, some beautiful specimens of our traditional textiles. A good few of these have been presented to some national museums which proclaim to the nation and to the world of Fine Arts "the glory that was Ind".

Muslins. Dacca (now the capital of Eastern Pakistan) was, for centuries, synonymous with the finest muslins the world has ever produced by hand or machine. In the words of Dr. Forbes Watson "with all our machinery and wondrous appliances we have been hitherto unable to produce a fabric which for its fineness and utility can equal the 'Woven air of Dacca'." Indeed, the Dacca weavers' magic hands produced such exquisitely fine and delicate fabrics that the poetic names '*Ab-i-rawan*' (Flowing-water), '*Baft-Hawa*' (Woven-air), '*Shabnam*' (Evening dew) were

justifiably given to them. Exhibits in some of our museums prove even today that a yard's width of the muslin could easily pass through a lady's ring. Then there are legends which have collected around these fabrics. One of them relates that a five-yard piece of the muslin could be packed in a match box. It is, however, an authenticated fact that a 15 yard piece of 36 inches width '*Mulmul Khas*' (Royal muslin) in the reign of the Emperor Jehangir, weighed only 900 grains. Of course '*Mulmul Khas*' was the Dacca muslin.

The value of Dacca muslins is estimated by the number of warp-threads in a given length of the material as compared with its weight. The greater the length and the number of the threads, with comparatively less weight, the higher would be the price. For instance, a yard's width of '*Mulmal Khas*', the finest muslin, was known to have 1000 to 1800 threads in the warp, and the weaver took five months to weave 10 yards of the fabric. The weaving of these fabrics could only be done during the rainy season, because for the weaving of such an extremely fine fabric, a humid atmosphere was essential.

Dacca Saris. Upto the beginning of the 19th century, the Dacca muslin saris, one of the most artistic and beautiful specimens of hand-loom textiles, were counted amongst their valuable and cherished possessions by the women of Bengal. Even today, these saris are beautiful in their designs, but alas the art of making fine muslins is no more, and the saris too are not half as fine as they were in the past.

The saris are generally grey, white or black with blue or black designs. Occasionally, the patterns are woven in with bright coloured cotton, or silver or gold threads. The Dacca muslins with the woven-in pattern are known as '*Jamdani*' and the typical designs of flowers or figures used by the Dacca weavers are known as '*Jamdani*' pattern. The saris have very bold and large *Jamdani* pattern on the '*Anchal*' '*Palloos*' (end portion) and the borders. The rest of the sari is generally covered with numerous small *bootties**. The common motif is the round design bootties, which suggest *Chameli* (*Jasmine*) flowers and around these are woven the leaves that recall those of the sweet smelling *champak*. When the sprays of flowers are spread all over the sari, it is called a '*Boottedar*' sari, and when the sprays are grouped in diagonal

*Bootti is a design of a single flower or figure, and Buttedar is the term used to denote floral or other designs in figured fabrics.

lines, the sari is known as '*Terchha*'. But when the floral design forms a net-work which covers the entire field, then the pattern is known as '*Jatar*'.

Sometimes in *Jamdani* designs, the flowers are clustered together like the settings of jewels, and then the pattern is given the poetic name of '*Panna hazare*' (thousand emeralds). If a running floral pattern covers the whole field, the expression *Phulwar* is used; but if the flowers are large and life-size the *Jamdani* is called *Toredar*.

The borders and *Palloo* or *Anchal* (end portion) of saris are generally decorated with distinctive figure designs. The figures chosen represent birds, animals, and human beings. Peacocks or '*mayura*' and herons or '*hansa*' seem to be popular as bird-figures in the designs of Dacca saris. Also some of the motifs indicate the influence of mythological legends, as well as of the local traditions. The designs are commonly accepted as of Persian origin but many of the designs depict incidents from the Hindu mythology also.

The most striking feature of the *Jamdani* pattern is the skill of the weaver in being able to depict the conception of actual motion in the figures he weaves in. Many a design presents birds with flapping wings as if they are about to fly away. The outlines of figures are always bold, straight and invariably geometric in clean cut lines. Also the intervening space is so well balanced with lines and flowers that a most delightful effect is produced by the combination. It may well be imagined that the weaving of such masterpieces called for the highest skill and craftsmanship with almost unlimited patience as each design must have involved months of work.

An idea of the skill of the weavers may be formed from the following description of the process of weaving.

"The long warp threads being arranged, the weaving is begun as in the case of an ordinary cloth, and a pattern of the embroidery drawn on paper is pinned beneath. As the weaving goes on, the workman continually raises the paper pattern to ascertain if his woof has approached closely to where any flower or other figure has to be embroidered, and when the exact place is reached, he takes his needle (*i.e.*, a bamboo splinter), and as each woof thread passes through the pattern, he sews down the intersected portion of it, and so continues until it is completed. When the embroidered pattern is continuous and regular as in the usual sari border, the weaver, if a skilful workman, usually dispenses with the aid of a paper pattern. Two persons generally work together at a piece of *jamdani* by which a great saving of time is effected."

Chanderi Saris. The muslins woven in *Chanderi*, a place

near Gwalior, have earned a name for themselves because of their fine quality. *Chanderi* saris are mostly cotton with borders and palloos woven in silk or gold threads. Sometimes mixed threads of silk and cotton are used for weaving the fabrics known as '*Garbhreshmi*'. The palloos of these are very artistically ornamented with gold threads while the ground of the sari is checked, with *bootties* in the centre of each check-square. The borders are woven with double threads which produce an effect of two colours, one on each side. The saris are woven in nine-yard lengths and are very much valued by the Maharastrian ladies.

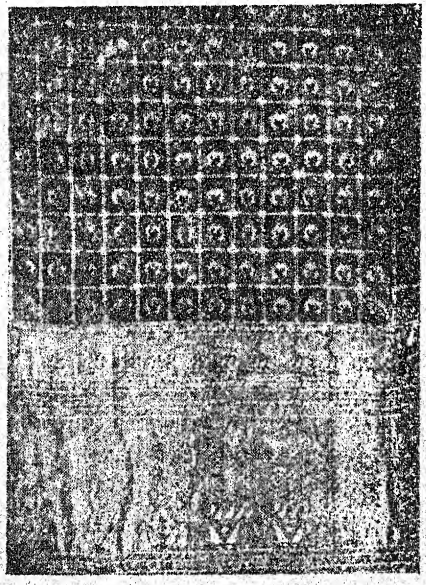


Fig. 54. Chanderi Sari.

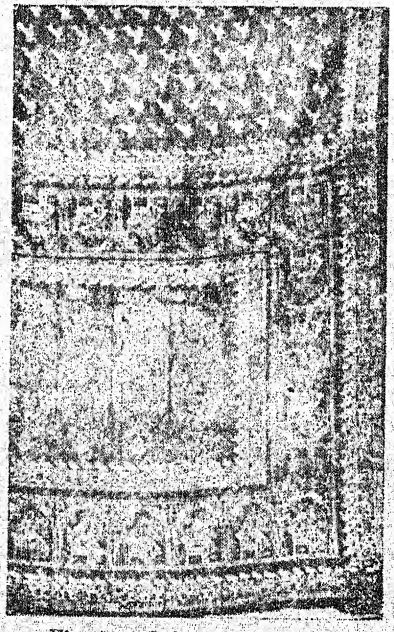


Fig. 55. Baluchar Buttedar.

Baluchar Buttedar. Baluchar, a small town near Murshidabad, has become a noted and a highly valued name in the handloom textile history of India. The artisans of the locality produced very artistic figured silk saris known as *Baluchar Buttedar*. In *Baluchar Buttedar*, as in Dacca saris, the *Palloos* were the most elaborately ornamented portions. The field of the remaining portion of the sari was decorated with small *bootties* of some floral design or figure design of birds. The special feature of *Baluchar Buttedar* is that the design used for the

ornamentation show a strong influence of Mughal Art, which is famous for its portraits. The weaver of Baluchar chose motifs of human figures and the popular '*Toranj*' (also called '*Kalka*' or '*Guldasta*') which is the most popular motif in weaving, embroidery and printing throughout India under its present appellation 'the mango design'* An illustration of *Baluchar buttedar* in Fig. 55 on page 87 shows the richly ornamented *palloo* and a portion of the field of the sari. In the design of the *palloo*, the famous ever popular '*Toranj*' are seen as though these are set in a frame. The border of the frame is again elaborately decorated with pictorial representation of a lady smelling a flower and seated in a sort of a nich. The interspaces are filled with neatly arranged rows of '*Toranj*' lined with an outer border of flowering plant. The border design which is a simple and straight combination of a small *toranj* and flowering plant is continued for the border of the whole sari.

The subjects for portraits were either a lady or a nobleman dressed in Persian dress and holding a flower or riding a horse or smoking. Though the subjects were always of Islamic origin, yet the *Baluchar Buttedar* were very popular amongst the Hindu ladies. This gesture indicates a complete absence of intolerance existing between the two communities.

Later on, probably due to the desire for the patronage of the English bosses of the East India Company the woven-in-pictorial subjects came to include figures dressed in European clothes, and holding instead of the traditional flower a wine glass.

The wonderful art of weaving figured fabrics in Baluchar is lost for ever and a few extinct scattered specimen in some museums are the sad mementoes of the perfection it had achieved.

Kam Khwab, Bafta and Ab-i-rawan (Brocade). *Kam Khwab* is the name given to real gold brocades. '*Brocades*' is the expression used by Westerners who at first called it '*Kin Kab*' or '*Cin Cob*'. According to their conception, brocades are thick textiles with woven-in pattern very prominently thrown up on the surface of the face of the cloth. Consequently, not only *Kam Kawabs*, but other similar textiles also like *Buftas, Amrus*, and *Himrus* are known to them by the comprehensive English name '*brocades*'. The poetic name *Kam Khwab* expresses the dream-like beauty and richness of the fabric. It literally means

*To the writer, the outline of design appears to resemble the arched neck of a thorough bred horse for which the Hindi equivalent is 'Turang'.

only a little less (*Kam*) than a dream (*Khwab*)|or a dream (*Khwab*) reduced (*Kam*) to reality.

The real *Kam Khwabs* are woven with pure gold threads and the silk yarn is added to provide a body and as a means for

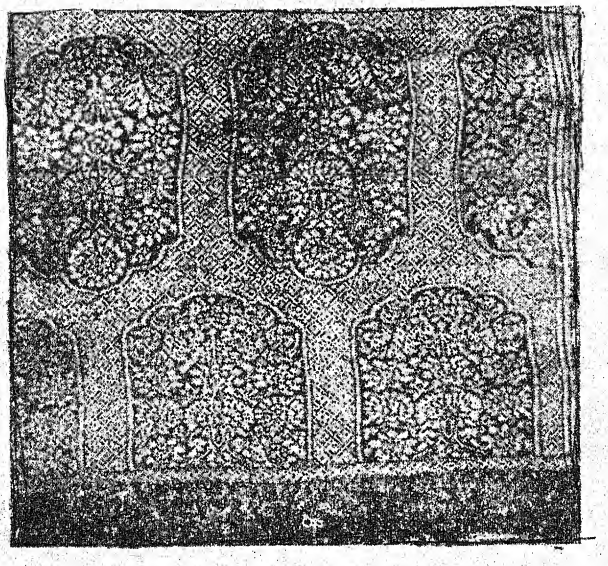


Fig. 56. Banaras Brocade.

colour illuminations. Silver or gold-plated silver threads are also used for keeping down the price but gold is usual. These are heavy fabrics and are generally used for making *palloos*, blouses and for men's halfsleeve Indian jackets, long-coats (*Angarkhas* or *Achkans*), ceremonial robes (*chogas*) and also later on came to be used for curtains and for upholstering the furniture of Public Rooms and Durbar Halls of Princes.

Bafta or Pot Thans. These are the brocades in which the major portion of the fabric is in closely woven silk with patterns in gold or silver at regular intervals. This fabric is usually woven in a narrow width of 20" to 30". This is not as heavy or thick as *Kam Khwabs* but is heavier than the other textiles. *Baftas* are also used for blouses and Indian skirts (*Lehngas* or *Damans*) and for men's *Angarkhas* or *Achkhans* too.

Ab-i-rawans. These are silk gauge materials with gold or silver patterns only on certain portions. Silk gauze series with woven-in gold borders and *palloos*, are also called *Ab-i-rawans*. The literal meaning of this poetic name is '*flowing water*'.

Although brocades are a speciality of Banaras for which it is

famous yet these are also manufactured at Surat and at Ahmedabad. Fig. 56 shows a Banaras *brocade* and Fig. 57

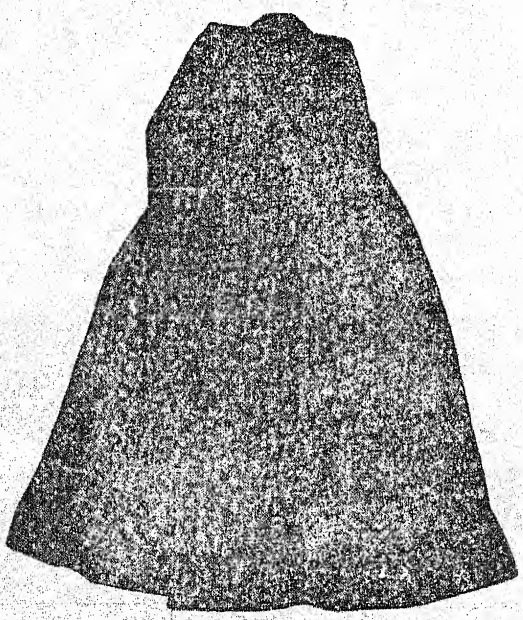


Fig. 57. Angarkha made in Ahmedabad brocade.

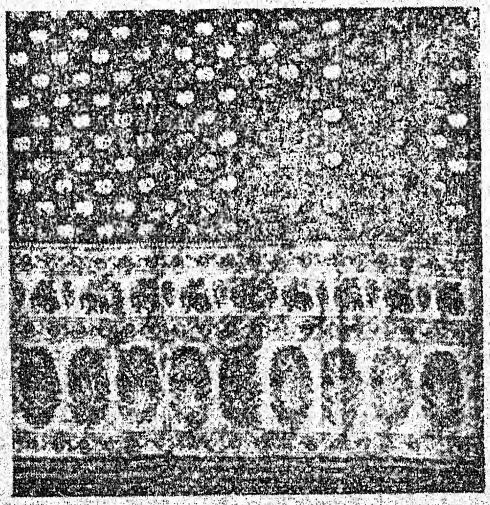


Fig. 58. A brocade silk sari.

shows an *Angarkha* made in Ahmedabad brocade. The designs

in the illustration depict the traditional floral motif. In old brocades motifs representing animals and human figures enclosed within floral borders were in use.

Himrus and Amrus. *Himrus* are the famous silk brocades of Hyderabad (Deccan). The State's second largest town—Aurangabad is the chief centre of the art of Himru-weaving. *Himru* probably a derivative of the Sanskrit *Him* (snow) is a fabric used in winter. The ground is cotton, and silk is used for the brocade on the surface. The yarn used for weaving *Himrus* is spun so as to produce, when woven, the effect of a warm soft material like wool. The peculiarity of the *Himru* is that the silk thread which is used to form a pattern on the surface of the cloth, is carried to the reverse side of the cloth and is collected there in clumsy long loops. This forms a rather loose but soft warm layer. Further, the accumulation of the loose threads on the reverse of the cloth, necessitates a lining to all garments made of *Himru* cloth. Thus *Himru* garments make very warm clothing suitable for the cold season.

When silk thread is used exculsively for weaving *Himru*, the fabric is called '*Amru*'. *Amrus* are generally made in Ahmedabad, Surat and Banaras. *Himrus* are used for men's *Achkans*, *Chogas*, and for female wear also, *e.g.*, for blouses and *Lehngas*. For generations, the Nawabs of Surat used a special quality of *Himru* fabrics for their dresses which was called the '*Nawab's Himru*'. These fabrics are also used for upholstery and curtains.

Paithani and Pitambar. *Paithanis* are the beautiful and rich saris made at Pattan or Paithan in the state of Hyderabad (Deccan). These are exquisitely fine silk fabrics with gauze like texture ornamented with gold patterns woven in the texture of the cloth. The borders and the *palloos* which are woven separately as gold brocades are sewn on to the sari. The colour

Fig. 59. Paithani.

of the sari is usually dark orange, red or yellow, with gold lines arranged in a check or in stripes. The inter-spaces are usually filled in with a figure design depicting a goose with an olive branch in its beak.

The borders and the *palloos* have very striking designs in bright and showy colours such as moss-green, canary yellow, and bright pink. The common motif of the designs is the peacock supporting a big vase with sprays of brilliantly coloured flowers so arranged as to form a Persian cone pattern. The illustration (Fig. 59) of a *Paithani palloo* does not have the favourite peacock in the design, but it depicts the harmonious arrangement of the sprays and the surrounding floral design. The vase with sprays is placed between two pillars joined with the *toran* (arch). The design is worked in silks of blue, red, and white colours on a field of pure translucent gold. The whole effect is gorgeous and is eminently artistic in its perfect harmony.

In olden days *Paithanis* were usually woven to order for the Royal family and the weaver took months to complete a single piece. The value of a genuine real *Paithani* ranged between Rs. 2000 to Rs. 3000. In modern times, however, such highly valued and gorgeous *paithanis* are not woven.

Pitambars are bright coloured silks 5 yards in length with gold borders sewn on them. These are worn by men specially when performing any of the religious rituals.

Patola is an artistically ornamented fabric. It is a specimen of wonderful combination of the craft of tie-dying (*Bandhana*) and weaving. *Patola* is mostly in use as a wedding sari in Kathiawar and Gujarat. In Java and in Indonesia too the *Patola* fabric is used for wedding dresses. The fabric is so exquisitely and so highly valued that it is handed down from generation to generation in the family. Women of Gujarat and Kathiawar treasure the possession of a *Patola* with pardonable pride.

Patola, unlike the other ornamented fabrics, is invariably woven in just the plain weave. The elaborate and intricate patterns which mark the *Patola* saris are produced by the wonderful art of *Bandhana* or tie-dyeing. The silkyarn with which *Patolas* are woven, is first dyed by the *Bandhana* process before it is put on the loom. The yarns, both warp and weft, are dyed in the lightest of colours. Then they are stretched on the ground, and the dyer proceeds to mark certain portions to

indicate the lines of the desired design. His wife who helps him in his work, then ties up the marked portions with cotton thread

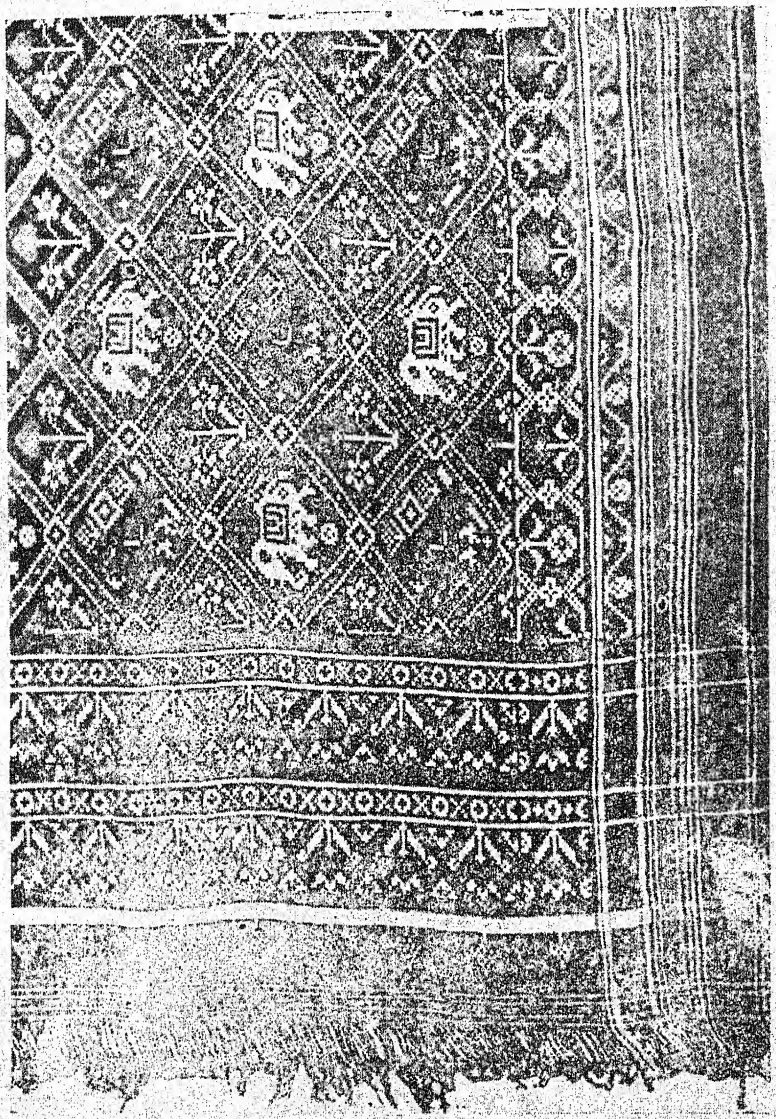


Fig. 60. Patola.

so tightly that the next dye cannot penetrate through to the tied up portions. The yarn is then immersed in dye-baths of the

desired colours and shades. The operation of tie-and-dye is repeated several times until all the colours and shades required for the planned design have been applied to the yarn. The dyer begins with a light colour, passes next to a bright one and applies the dark colour at the very last. Then the weaver starts on his job. The warp threads are arranged in pre-arranged sequence, and the weft is then interlaced one by one very carefully to form the planned design. The process of producing a *Patola* is, therefore, a very laborious one and is extremely complicated too. Meticulous care and a good deal of creative imagination is needed for marking the correct portions on yarns for dyeing in different colours of the pattern. A very retentive memory is another essential requisite for registering and recalling accurately the sequence of the coloured threads in the pattern. Thus only a few traditional designs are used for *Patola* patterns. The following eight are used by the weavers of Pattan as described by Mr. G.V. Patel :—

"1. *Nari-Junjar bhat* or dancing girl and an elephant design. It has necessarily a parrot included in it.

2. *Pan bhat* or leaf design. It is said to be the leaf of the sacred *pipal* tree. (*Ficus Religiosa*).

3. *Rattan chawak bhat* or the cross of diamonds design. It has interspersed diamonds also.

4. *Okhar bhat* or water crest design. The real name of this design on investigation at Pattan, appears to be *akhrot bhat, i.e.,* the walnut design.

5. *Phulvadi bhat* or floral design is generally enclosed in diapers outlined by a single line. Each diaper contains three flowers.

6. *Wagh-Kunjar bhat* or tiger-elephant design. The animals alternate with each other in the design.

7. *Chabri bhat* or basket design. Here each enclosure containing an elephant is made up of four quadrants which look as if forming a basket when two of them are taken together.

8. *Chowkhadi bhat* or a diaper with a double outline design. Each diaper includes three flowers borne on a stem."

There is one more design which is used for *dhoties* (the loin cloth worn by men). This design consists of the *devnagri* alphabet and the forms of the letters follow those of the *mantras* (hymns) in religious book.

Pattan, a place in Kathiawar, is reputed to be the birth-place of *Patola*. The weavers of Pattan later migrated to Bombay, Ahmedabad and Surat and the making of *Patolas* started at these places also.

Orissa weavers also have adopted the *Patola* technique for

weaving their special fabrics like curtains, bed spreads, *odhnis* (scarfs worn over the head and draped round the shoulders and waist by women) and saris. The famous Sambalpore saris are woven like *Patolas*.

Bandhanis. *Bandhanis* or *Choonaris* are the colourful saris and *odhnis* dyed by tie-and-dye process. These are popular amongst the women of Gujarat, Kathiawar, Rajputana and Sindh. Premlata Jayakar in her article on 'Tie Dyed Fabrics of India,' in "Marg" refers to *Bandhanis* in the following words :—

"It is an auspicious garment. A symbol of youth and romance, love play and the '*Sohag*' (wifehood) of Hindu women. It is a garment of laughter."

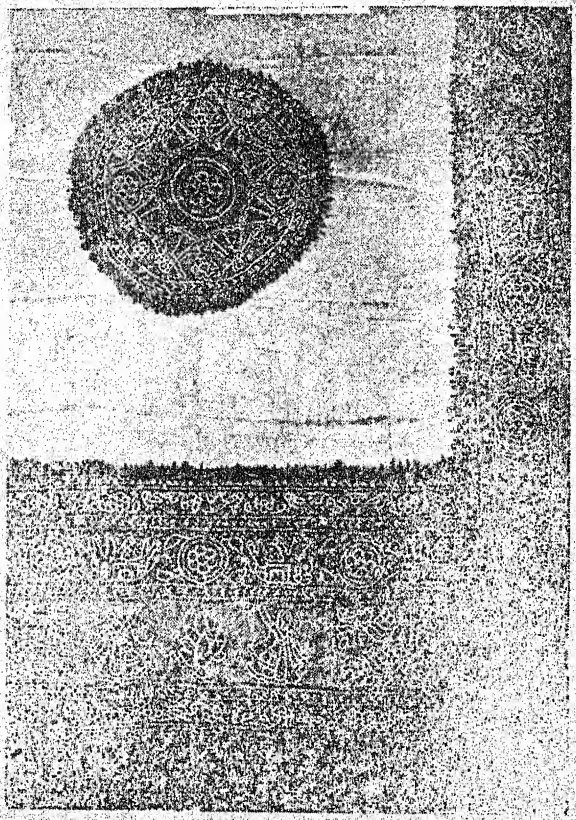


Fig. 61. Bandhani Sari.

Indian women are known for their love for bright colours.

Also the tradition and the customs of wearing special colours on different festivals, makes it necessary for them to become familiar with the art of dyeing at home. Thus besides the expert professional dyers almost every Indian girl learns by practice a good deal of the art of dyeing and *Bandhani* work.

Bandhanis differ from *Patola* as regards the stage at which they are dyed. Like *Patolas* they are dyed by the tie-and-dye process, which, however, is done after the fabric is woven. The fabric is folded over several times until reduced to a small thick square or a rectangular piece. The piece is then damped and pressed on a block on which a design has been carved. The impressed portions are picked up by the finger nails (the nails are allowed to grow specially for the purpose and are used as a sort of pincers) and are then tied up with cotton thread in a thickness sufficient to resist the dye. It needs training and great skill to pick up all the layers at once and make it crinkle in a particular given manner. The *Bhandhanari* or the woman who does the tieing up work works swiftly and ties up all the impressed portions without cutting the thread but carries it over from one point to the next. The dyeing process is carried out in the same order as in *Patolas*, starting with the light colours and finishing with the dark ones. But each time, before a new shade or colour is applied the tieing up process has got to be repeated.

Fig. 62. Chunari worn by a Gujrati girl.

Usually, the designs used are copies of a few traditional ones and by the practice of tieing-up the same design over and over again the *Bandhanaris* become expert to such an extent that they are able to dispense with the process of impressing the fabric with the design.

The motif of the traditional designs used for *Bhandhanis* represents animals, birds, flowers and dancing dolls. When elaborate designs are used the *Bandhanis* are known as '*Gharchola*'. In some of the expensive '*Gharchola*' gold threads are woven in to form checks or squares, and then the designs are

formed in each of the squares by the tie-and-dye process. The '*Choonaries*' are very light fabrics, and the designs for these consist of dots or pin heads irregularly spread all over the field of the cloth. Sometimes the dots are grouped together to form a design, and the design is known as '*Ek bundi*' (one dot), '*Char bundi*' (four dots) and '*Sat bundi*' (seven dots).

It might interest our readers to know that in some parts of Rajputana, *e.g.*, Alwar, professional dyers existed till a couple of decades ago, who could dye even the finest muslin in two different colours, one on each side of the fabric at the modest charge of only annas four a yard. This art too is now extinct but specimens can be found in some museums.

Kalmendar or Kalamdar. This is the name given to the handpainted cotton fabrics. They are so called because the artist

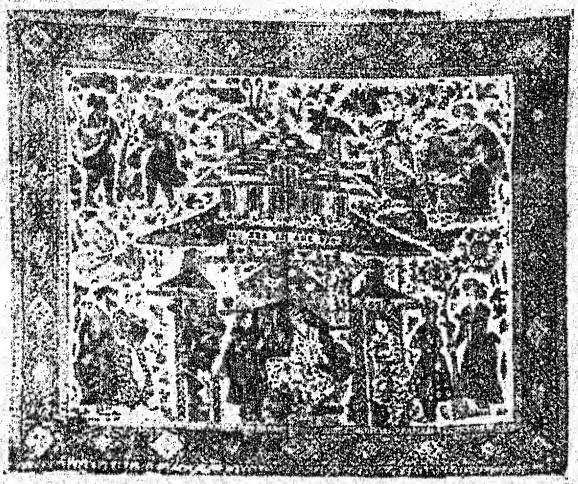


Fig. 63. Calico Painted Cloth.

works out the designs on the material with a fine steel brush not unlike a pen (*Kalam*). The process is very much the same as used for *Batik work*. The basic principle, namely, resist-dyeing, being common to both. The material is first dyed in pale pink and then stretched out tight. The artist then traces the outline of the design with his *Kalam* or fine steel brush dipped in melted wax. The fabric is then dyed deep red and finally washed in hot water to melt away the wax. This produces the design in deep red on the background of pale pink.

Kalamdar fabrics are also called *Palampores* in the textile

trade. They are available in rectangular pieces and are popular with Hindus and Muslims alike. The former use them as canopies for the images of their gods and the latter as praying carpets. Those designed for Hindus portray scenes from the Hindu mythology, whilst those intended for Muslims are of Islamic origin. The latter depicts the conventional *Mirhab* with panels forming a frame enclosing the 'Persian Tree of Life' complete with birds and the branches and animals resting under its shade. The craftsmanship and the skill of the dyer is amply borne out by the excellent portrayal of the minutest details with amazing accuracy. The French traveller Bernier who visited India in 1663, during the reign of Emperor Shahjehan, thus describes the fabric which formed the drapings of the Imperial courtyard :—

"And lined within with those *chittes*, or cloth painted by a pencil of Masulipatam, purposely wrought and contrived with

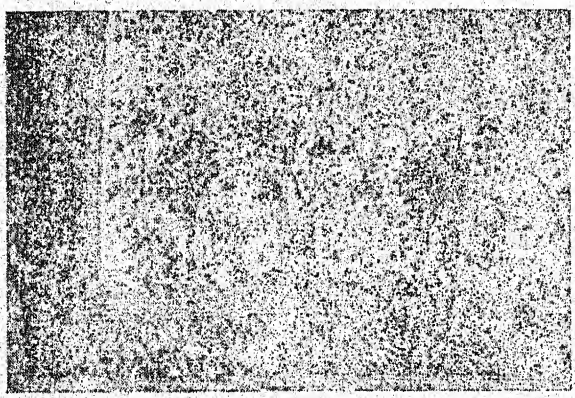


Fig. 64. Palampore.

such vivid colours and flowers, so naturally drawn, of a hundred several fashions and shapes, that one would have said it was a hanging parterre."

Embroidered Fabrics. India is rich in embroidered fabrics. The Indian art of embroidery is an ancient one. Its origin can be traced right back to the Vedic age and it appears to have been well-developed by the time of the great epics. Later on, the influence of incoming races and tribes particularly those which migrated from the hills contributed a great deal towards the development of the art along lines which have given it, its present form. "The stitches employed and art conceptions displayed" by these early artists indicate the extent of their

knowledge of the art. It may be noted that throughout the mountains and valleys of India, the art is very popular and is assiduously pursued by men and women. The very colourful embroidery produced is not always intended only for the market, but for home use as well.

A few of the better-known embroidered fabrics may now be briefly described.

The Punjab Phulkari—Phulkari really means flower (*Phul*) work (*kari*). These were the conventional ceremonial shawls worn by the Hindu bride at her wedding when going round the sacred fire with the bridegroom. It is a popular saying in Punjab that when a girl is born in a family the mother, or may be the grand-mother, starts embroidering a *Phulkari* to be presented to the girl on her wedding day.

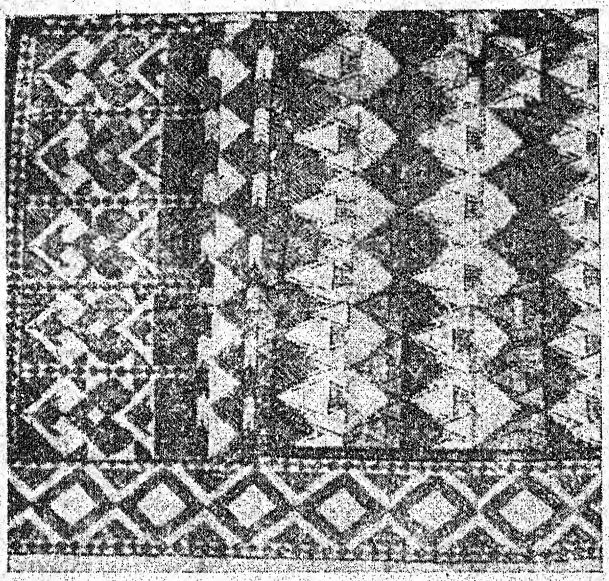


Fig. 65. Phulkari.

The women of the *Jat* community are specialised in *Phulkari* work. In almost all the districts of the Punjab, wherever this community settled down the *Phulkari* work originated and has flourished. The peasant women of Rohtak, Hissar, Gurgaon and Karnal are known for embroidering the best *Phulkaries*. Rohtak is considered to be the home of *Phulkari* work.

The stitch for *Phulkari* embroidery is the simple darn stitch.

The material on which the embroidery is worked is rough *Khaddar*, but the thread used for the embroidery is silk and the colours used are white, red, yellow or green. The colour of the *Khaddar* material is invariably red, maroon or brown.

The *Phulkari* motifs generally are of floral patterns, but geometric patterns are also used. For instance in the *Bagh* or *Shalimar* design, the entire material is covered with a geometric pattern. In orthodox *Phulkari*, however, the same floral pattern is embroidered only at intervals on the cloth, intervening portions of which are left plain. Sometimes, only the borders are embroidered to a width of 3 or 4 inches and the centre of the material is left plain. This pattern is known as *chobes*.

Fig. 66. Embroidered Cloth of Kathiawar.

The choice of the design is wide, but very often they appear

to be almost identical because of the close and compact stitches used. It is remarkable that the illiterate village women choose designs and the colour schemes which have a charm and beauty of their own and which are worked out unerringly by memory.

Shishedar Phulkaries. These are different from the other *phulkaries*. The special feature is that the embroidery is embellished with tiny mica or looking-glass (*Shisha*) discs fixed to the cloth by button-hole stitches. The material embroidered in this way is very often silk, or even satin. Sindh specialises in this kind of *phulkaries* and is reputed to be its home.

The designs used indicate the influence of the Punjab as well as Cutch in the type of stitches used and the colours selected. The *phulkari* work of Upper Sindh seems to follow Punjabi *Phulkari* while that of the Lower Sindh bears a resemblance to the Cutch work. Besides the button-hole stitch, the darning stitch of Cutch are also used in the *Shishedar Phulkaries.*

Cutch Phulkari. This is a name given to the embroidered silk or satin material used for skirts in Cutch. Fig. 67 shows an

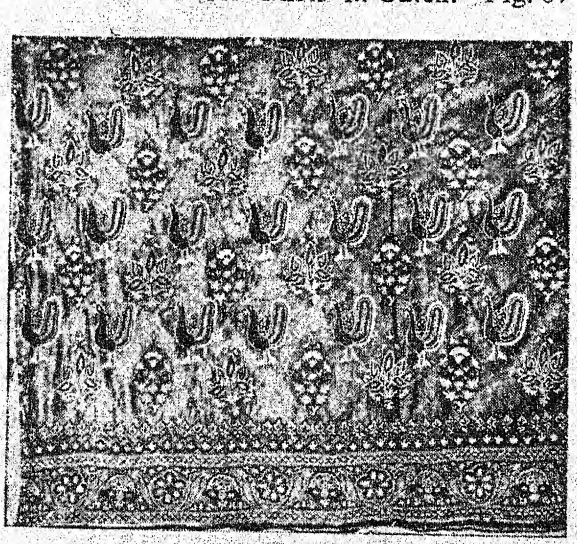


Fig. 67. Cutch *Phulkari.*

illustration of the Cutch *Phulkari*. The lower portion of the material is embroidered to form a border, and the rest of the material is filled with floral or figure designs. The popular figures chosen by the Cutch artist for embroidery are elephants, peacocks and parrots. Most of the embroidery is done in chain

stitch, but occasionally herring bone stitch is also used for finishing the edge of the border.

Chamba Roomals (Fig. 68). The *Roomals* of Chamba, a state in the Himalayan range, are remarkable pieces of embroidery. Princesses as well as shepherdesses are equally adept in the art which they have adapted as a pleasant or profitable pastime for their leisure hours. The *Roomal* is a square piece of cotton material of the size of a teapoy cover.

The material generally selected is very fine and of delicate texture. The embroidery is worked in double satin stitch which produces the design on both sides of the material and so a *Chamba Roomal* does not have a right or a wrong side.

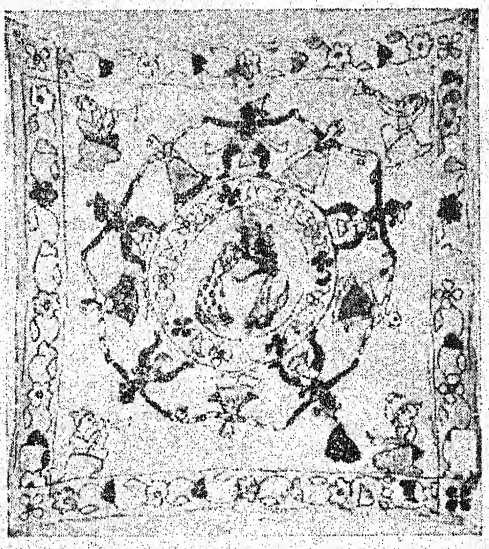


Fig. 68. Chamba Roomal.

The motifs for designs are figures, flowers, leaves, forming a sort of frame to set off the central representation of a scene from a mythological story or a legend. It is said of that embroidery that it "imitates the Pahari School of painting". The unique characteristic of the embroidery is that it gives a vivid impression of the embroidered figure being in action or in motion, thereby enhancing the artistic value of the *Roomals*.

Kanthas of Bengal. *Kanthas* are not original fabrics, but are made with lengths of old and practically used up cloth. Several pieces of about the same length are placed one on top of

another and the edges of all the pieces are sewn together so as to form a padded or quilted rectangular piece. Then the artist proceeds to depict beautiful patterns or scenes from stories from the epics or well known legends, by means of embroidery done in simple running stitch. The work is very fine and neat and accurately executed entirely from memory without the help of any tracing or drawing or any written notes. The *Kanthas* are therefore classed as works of art and one has only to look at them to agree.

The women of Bengal often devote their leisure hours in working *kanthas*, creating beautiful and artistic fabrics out of worn out clothes.

Embroidered Fabrics of Kashmir. Embroidered fabrics of Kashmir are world famous. The Pashmina shawls, the silk saris, the Namdas and the various other silk and woollen articles are praised as works of art. The Kashmir embroidery is

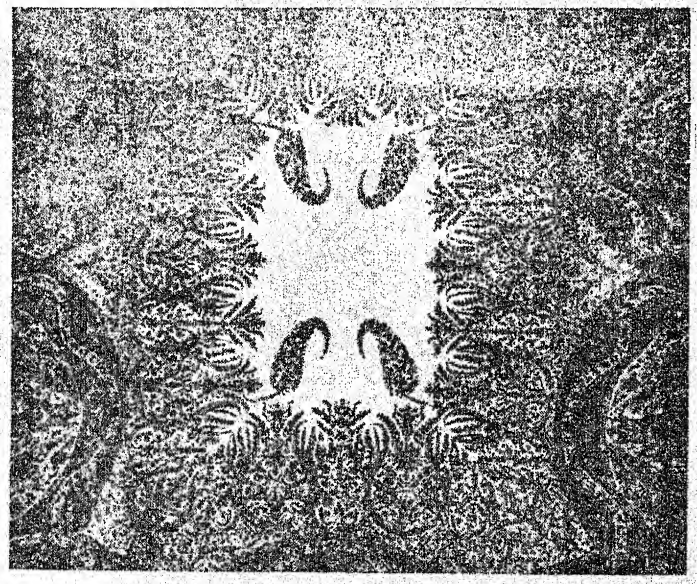


Fig. 69. Pashmina Shawls.

known as *Kaseeda*, and the stitches used are the satin stitch, the stem stitch and the loop stitch. The darning stitch is also used. The herring bone stitch is used for the edges of the finished pieces.

The craftsmen, in Kashmir, are generally men and are in-

variably assisted by boys, often of a tender age, who do the actual embroidery. It is interesting to observe the young boys at work. The master craftsman calls out from the design before him, the kind and the number of stitches to be put in. As the instructions are called out the boys work swiftly and deftly with needles and the stitches are completed almost as soon as the master has finished calling them out. The scene resembles that of a small class in a school with the boys taking down the dictation of the teacher.

Nature's bounteous gifts appear to have been literally showered on Kashmir and it is considered by many to be the nearest approach to "a paradise on earth". Kasheeda artists, therefore, under the inspiration of the beauty of the natural surroundings which they have succeeded in reproducing in their embroidery with such amazing skill, that in the words of Shm. Kamla Dongerkerry, "competes with the wealth of Nature's charms". The Kashmir artist has an inexhaustible treasure of motifs in gorgeous colours, ready at hand from which he can draw his designs. In Kashmir embroidery, therefore, we find bunches of fruits, foliage and birds of brilliant hues and innumerable shades of colour lend themselves as charming compounds of varied designs. And the *Turanj* (or the mango) is not ignored either. Indeed, it finds a place in almost all the *Kasheedas* of Kashmir.

The outstanding characteristics of Kashmir embroidery is its elegance and the harmonious grouping of the brilliant colours in the design which produces a restful and soothing effect. The workmanship is so neat and the stitches so fine that one wonders how bare human hands and that too of young boys could produce such work. It must, however, be remembered that the training of generations (the art is handed down from father to son in each of the families) has equipped the artisans with almost an intuitive aptitude for the work which has become second nature to them. On the other hand, the art lives only so long as the line of the craftsmen continue and is likely to become extinct with the line. This, alas, is what started to happen some time ago due mainly to the rage for replacing human hands by lifeless machinery. Paradoxical as it might appear science is fast stifling and killing art by restricting the scope of arts creation only to such articles as lend themselves to mass productions by mechanised processes.

The modern products of Kashmir are no longer as fine and delicate as in the past, and tend to lose their natural charm.

The embroidery is best done in silk but the identical patterns are also repeated in wool. Besides the *Pashmina* shawls and the silk saris, the industry produces many articles for use in the home.

Namdas are the embroidered rugs. The rug is a felted thick fabric manufactured by the process of pressing wool and cotton together. They are then embroidered in thick wool in bright colour designs similar to those on *Pashmina*. Kashmir Silk embroidered fabrics besides being colourful and rich in design

Fig. 70. Namda of Kashmir.

and comparatively inexpensive, are within the means of middle class people. Thus a wider patronage supports the industry and the art has flourished not by the patronage of the great and the rich alone.

Chikankari Embroidered Muslins. The white embroidery on white cotton specially on muslins is known as *Chikan* work. *Chikankari* is an industry nurtured and developed in the region

watered by Ganga and her sister Yamuna (Jamna). Lucknow in particular is the cradle and unrivalled centre of the art.

Chikan work lack in the attractiveness associated with colour yet has a fascination of its own, unequalled by few and surpassed by none. Whilst the *kaseeda* of Kashmir may be rich in colour, reflecting in silk the ravishing beauty with which Nature has gifted the valley; the virgin white *chikankari* is perhaps a translation in simple cotton of the purity of the waters of the sister rivers born in the home of perpetual snows—the Himalayas. Much credit for the high position of the art of the Kashmir embroidery goes to its attractive colours. The fact that without that colourful aid, the *chikankari* has attained the same eminence, is eloquent of its great artistic value.

Daintiness and delicacy (which are the hall-marks of all Lucknow works of art) added to a finish and a richness of its own, are the outstanding characteristics of *chikankari*. The work is sometimes so fine that to the naked eye it presents the appearance of having been woven-in, along with the fabrics.

There are two main styles of *chikan* embroidery :

(1) The flat—this group includes the *bukhia* and the *katao* styles.

(2) The knotted or the embossed, of which the *murri* and the *phanda* are the well-known varieties. To these may be added a third style, namely, the *jali* or netting which is akin to the drawn-thread-work, but is produced in an entirely different way. The drawing out of threads is regarded slovenly by the jali embroiderers. Instead, the fabric is pieced with holes of the requisite size to suit the pattern and these are then tied up to produce an appearance of net. *Jalis* are of different kinds variously named *Madras Jali, Calcutta Jali,* etc. and are very elaborate and intricate.

The varieties of designs are said to be thirty in number. Considering the fact that the colours are not used to vary the designs, and only the forms and motifs alone produce the various patterns, the number is creditable. The design represents familiar objects connected with daily life, often grains like rice and millet, in a variety of combinations.

The *bukhia* is the most intricate as it is the most remarkable of *chikan* designs. It is supposed to be the true *chikan*. Shrimati Kamla S. Dongerkerry considers it "comparable to the

shadow work of the present day" and thus describes the technique of its production :

"The stitches in this design cover the back of the cloth in the style of the herring-bone stitch, producing an opaque effect on the surface of the fine white fabric and at the same time an outline of motifs of flowers and leaves with minute stitches resembling the strokes of the back stitch.

The *katao* produces an effect similar to *bukhia.* The same fabric is used to produce an opaque effect and for the outline a simple ordinary stitch is used.

The *murri* and the *phanda* are used mostly in the patterns representing grains."

Chikankari work is mostly used for sari borders, blouse or kurta collars and till recent times it was also used for the neck pieces, the cuffs, and even the hems of men's *angrakhas* (long coats). It has lately come into use as table linen, tea-cosy covers, and numerous other washable articles of domestic use. Probably due to the influence of the Western customers who invariably look for colour in Eastern products, the embroiderers have begun to use coloured threads to a little extent which alas deteriorates the pristine elegance of the spotless white.

LAUNDRY WORK

10

Detergents

Soap has held the field for centuries as the chief substance that removes grease and dirt from fibres. For centuries nobody understood exactly how it worked, only lately its how and why has been discovered with the result that a new class of synthetic soaps or as they are now called detergents has been discovered. This has revolutionised washing in the homes and industry. We will deal with these at the end of this chapter. Now soap alone does not hold the field, all the substances that wash clothes are called detergents, soap being one of them.

Soap, as is well known, is a compound of fatty acids and alkalies. It is interesting to note that the discovery of the cleansing properties of this compound originated in an accidental mixture of left-over cooking fat and wood ash. Wood ash had been in use till then by the primitive people for cleaning their garments. It contains salts such as *hydroxides* and *nitrates* of *sodium* and *potassium* and so, the ash has an alkaline effect and has a cleansing action to some extent. Later on, fat was mixed with salts of potassium and sodium to make crude soap. Till the end of the eighteenth century, soap industry was entirely a home industry. In the beginning of the 19th century, small soap factories were established and now it is one of the big industries in India and the world.

Action of Soap. 1. Soap makes the penetration of water into the fabric easier. It helps to break down the surface tension or the surface resistance of fabric and thus, soap solution will wet the fabric more readily than plain water.

2. The dirt in the fabric consists of grease and dust particles.

The soap solution breaks up the grease into small particles, which come off the fabric and float in the solution. With the removal of the grease particles, the dust particles also are loosened, as they have a greater affinity for soap than for the fabric. Thus, the fabric is made free from both, grease and dust.

3. When soap comes in contact with water, alkali is liberated by the action of water on soap and helps the emulsification of greasy dirt, thus facilitating the washing process.

4. Most of the non-greasy dirt is removed in steeping by the pedesis of water or the movement of water particles. Soap in water increases the pedesis and thus, quickens the removal of non-greasy dirt.

Varieties of Soap. There are many brands of soap—the variety is brought about by the incorporation of special oils, perfumes and colours.

The two main classes of soap are (*i*) *hard soaps*, and (*ii*) *soft soaps*.

Hard soaps are those which cannot be easily rubbed on to the surface to be cleaned. They do not dissolve easily in water and hence, do not give free lather. This means more labour and so, more time to launder a dirty material.

Soft soaps, on the other hand, dissolve readily in water and give free lather ; but because of these very properties they are wasted more in use.

The hardness or softness of soaps depends on two factors, namely—(*i*) the kind of fats and alkalies used, (*ii*) the process of soap making.

Fats, which are composed of the higher series of fatty acids, such as stearin and palmitin in large proportions and so, are termed "hard fats," make hard soaps ; *e.g.* Tallow and Coconut oil produce a hard soap with a firm texture ; while castor oil or linseed oil makes very soft soaps.

The alkalies used in soap making are (*i*) *caustic soda* and (*ii*) *caustic potash.* Soaps made from caustic soda are generally harder than the soaps made from caustic potash.

The processes used in soap making are of two kinds—the cold process and the hot process. Soaps produced by the hot process are, as a rule, harder than those made by the cold process.

In addition to the laundry soaps there are other varieties too, *e.g.*, toilet soaps, disinfectant soaps, shaving soaps, transparent

soaps etc. In these also a large variety is brought about by the variation of different oils, perfumes and colour.

Colour and perfumes are not used in laundry soaps. These are either white, cream, yellow or dark. They are sold in the market in bars, chips, cakes or flakes.

Some bars soaps and other cheaper household soaps are of a dark colour which is due to the presence of resin which decreases their cleansing action. Sodium carbonate, chloride or sulphate slightly increase the detergent property of soap. But these alkalies make the soap hard and further allow a much greater proportion of resin and water to be included in the components of the soap. Soaps containing a large quantity of resin and water, will have little real cleansing action, and will be expensive in use as they waste away rapidly when in contact with water.

Soap flakes are neutral soaps. These are white in colour and are obtained by flaking a fairly hard, good quality white soap which has no free alkali. These have best cleansing properties and are used particularly for cleansing expensive silks and woollens.

Turpentine is sometimes added to improve the cleansing power of soap that is used for very greasy articles.

Properties of a Good Laundry Soap. A good or genuine soap should—(*i*) contain 30% of water and 61-64% of combined fatty acids; (soaps containing less water dry on exposure to air); (*ii*) be free from alkali and resins; (resins, which consist chiefly of the sodium salt of abietic acid, are very much used for the fatty matter of the soap, but these soaps, if continually used, make clothes yellow and hard) and (*iii*) be readily soluble in water and also give a good lather.

Materials Used in Soap Making. The two chief materials in the making of soap are fats and alkalies. Other substances such as silicates, starch and soap stones are added as filling agents.

Fats. A fat is a combination of fatty acids and glycerines. Example of pure fats are stearin, palmitin and olein. Most of the natural fats are made of a mixture of these and others esters. A fat is hard if it consists of a large proportion of stearin and palmitin.

In soap making, both animal and vegetable fats are used. The animal fats are (*i*) *Tallow*, (*ii*) *Lard*; and the vegetable fats are (*iii*) *Coconut oil* and (*iv*) *Cotton seed oil.* Generally, the

animal fats are harder than vegetable fats and make hard soaps with the best cleansing power.

Tallow is composed of stearin, palmitin and olein. This makes a soap uniformly compact in texture, does not give free lather; has very good cleansing and keeping properties. Tallow is usually blended with other oils and fats to impart firmness to the soap.

Lard is composed of stearin and olein. It gives a better soap than tallow, which lathers freely in water but owing to its high price is used only in toilet soaps.

Coconut oil is the most important fatty substance used in soap making in India. It is available in abundance and makes a good white soap. It is used for making marine and hard water soaps. Another advantage of this oil is that it saponifies readily and thus soap can be easily made by the cold process with this oil as a component.

Cotton seed oil when refined makes quite a good soap with a high detergent (washing power) property. The soap is more soluble in water and lathers freely, but the lather is not of a permanent type. Hence, the addition of tallow improves the washing property of soap. Soap, made with this oil, will be comparatively cheaper, as this oil is available in abundance in cotton growing areas.

There are other oils such as *palm oil*, *castor oil* and *groundnut oil*, which are used to some extent in combination with the other oils. *Mahua oil* is cheap and is much used in making laundry soap. It makes a good, soft soap, and, therefore, tallow and coconut oil are mixed with it.

In soap factories, a mixture of animal and various vegetable fats is generally used in order to improve the quality of soap and cut down the cost.

Alkali. The chief alkali used in soap making is *caustic soda*. Sometimes *caustic potash* is also used. There is only a slight difference between the soap produced with either of these alkalies. Soap with caustic potash is softer in consistency and more soluble than the one made with caustic soda. Hence, in making soft soaps caustic potash is used; but for ordinary household soaps, caustic soda is used. Caustic soda is available in the form of sticks, flakes, blocks and solution. The sticks and flakes are very expensive; the solution has impurities; hence, the alkali in blocks is used in soap making.

Sodium Silicate. It is a brittle substance, which resembles glass. Liquid sodium silicate is a viscous liquid. It is generally of an alkaline character and possesses good detergent properties. Neutral silicate containing a smaller proportion of soda is used in the proportion varying from 5% to 25%. If too much is used, the soap becomes pasty and is wasteful in water.

Starch. It has the property of combining with water in the presence of alkalies into a gelatinous mass which is soluble and so it is added to make the soap firm. This does not affect the appearance of the soap but it deteriorates the cleansing action. Generally 2% is a safe quantity to use. In the cold process upto 20% is used.

Soap Stone. Soap stone or French Chalk is often used as filling agent to the extent of 15 to 20 per cent. But soap stone has neither the detergent properties of silicates nor the binding power of starch.

Salt. Salt is used for graining the soap out from a mixture of oils and alkali. The usual proportion is 100 parts of oil to 12½ parts of salt.

Resin. Resin is used in soap making to reduce the cost. The disadvantages of the use of resin are that it has less cleansing power than soap, and it tends to give a yellow colour to white materials. It should not be added more than 15 to 20% of the fat.

Manufacture of Soap. The usual method of soap making is by the process of saponification. When fat is mixed with alkali, the fat splits up into fatty acids and glycerine and the fatty acids combine with alkali to form a compound which is soap. This process is called saponification.

(*a*) **Boiling Process.** This is generally carried out on a large scale :

1. Fats, oils and the alkali (caustic soda) are purified.
2. Fats (animal or vegetable) are melted in a large pan.
3. A weak solution of caustic soda is added gradually and the mixture is boiled by steam passed directly in the pan.
4. Some of the fat is saponified, and the soap formed forms an emulsifier of the whole mixture. More caustic soda solution is added at intervals and the process of boiling is continued for two or three days.
5. The contents of the soap pan are soap, glycerine, excess of caustic soda and impurities. Brine solution is added which

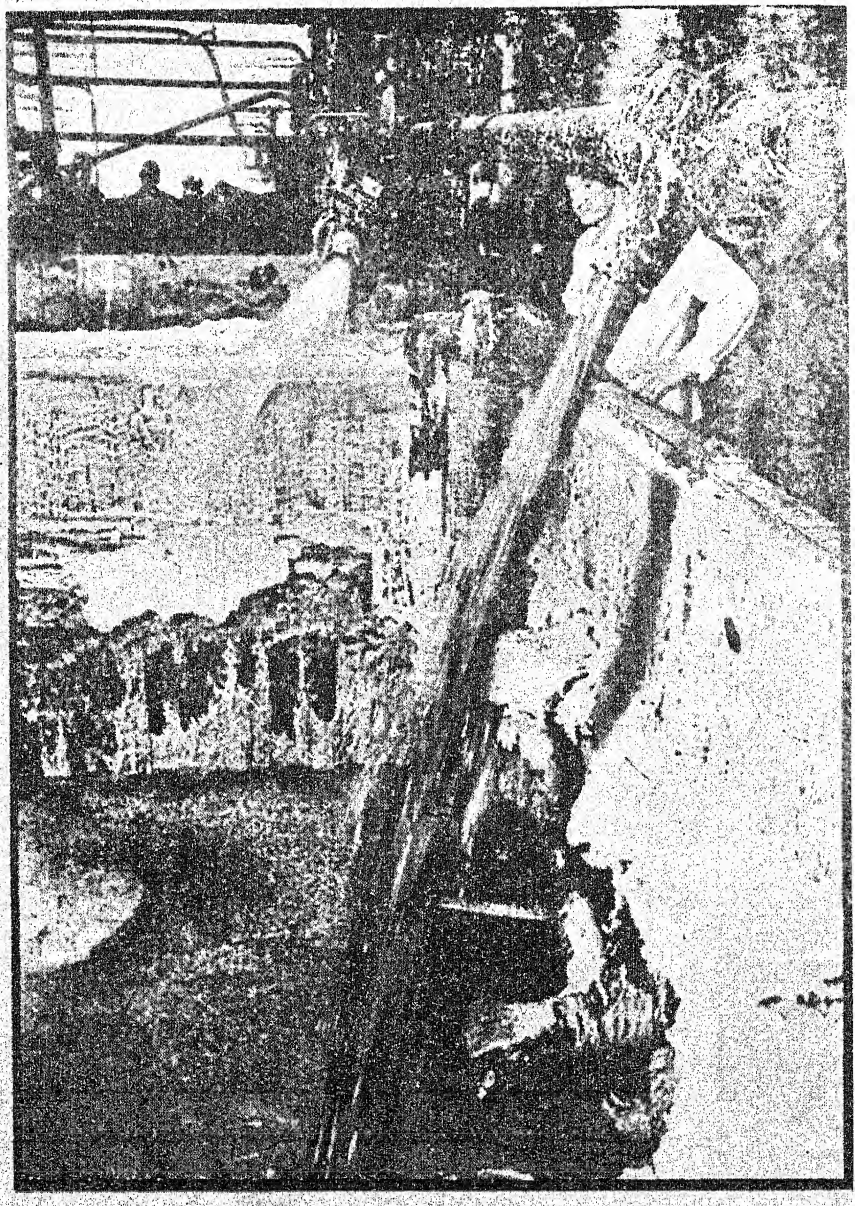


Fig. 71. Soap making by boiling process—melted fat and purified alkali are mixed in the pan.
(By courtesy of Messrs. Lever Bros. & Unilever Ltd., London)

separates the soap out, and this forms a layer on the top. The liquid under this layer consists of glycerine and impurities and is known as "Spent lye".

6. Spent lye is taken out and glycerine is distilled and stored.

7. The soap layer is mixed with water and boiled and made into a paste. This may contain some unsaponified fat and, therefore, more caustic soda is added till saponification is complete. Brine solution is added as before and spent lye is taken off.

8. The soap is then boiled with steam and left to stand until four layers are formed. The top layer is just a forth, the second layer is the genuine soap, which is run off by a pipe, the third layer is an impure, dark coloured soap and the fourth layer is some alkaline liquid.

9. The genuine soap is passed into crutching pans when colours or perfumes or some adulterants are added. Then the soap is moulded and cut or made into flakes or powders.

(*b*) **Cold Process**. This is a simple and quick method of soapmaking. One of the oils is mixed with caustic soda. The heat given off by the mixture is sufficient to carry out the process of saponification which takes at least a day or two to be completed. It is necessary to take the correct proportion of the ingredients. This soap has more cleansing power in cold water than in hot.

RECIPES

No. 1

Caustic soda	...	250 gms.
Water	...	4 cups (large size)
Coconut oil	...	1 kilo
Gram powder (*Besan*)	...	250 gms.

Method.

1. Dissolve caustic soda in water, stand the solution in an earthenware pot for 3 to 4 hours.

2. Mix gram powder (Besan) and oil in a big bowl.

3. Add caustic soda solution to the mixture of oil and *besan* a little at a time and beat it in. Continue beating till the mixture is of a thick consistency.

4. Pour the mixture in moulds, and allow the soap to set.

Note: Care should be taken to beat the mixture in one direction only.

No. 2

Caustic soda	...	250 gms
Water	...	8 cups
Mahua oil	...	1 kilo
Wheat flour (*maida*)	...	500 gms

Method.

Same as for coconut oil soap.

No. 3

Caustic soda	...	1 pao—8 oz. (250 gms.)
Water	...	5 cups
Coconut oil	...	1½ seer—3 lbs. (1·5 kilo)
Maida or *besan*	...	1½ Pao—12 oz. (375 gms.)

Method.

1. Dissolve soda in water.
2. Warm the oil, mix *maida* and oil.
3. Add the caustic soda solution to the mixture of oil and maida. Stir in one direction. Continue stirring until a thick consistency is formed.
4. Pour in moulds and allow to set.

SYNTHETIC SOAPS OR DETERGENTS

Soap molecules consist of two parts, one part consisting of sodium is soluble in water and the other part stearate soluble in grease. So if there is another cheap substance which has the same kind of molecule should also behave like soap. When such compounds were synthesised it was discovered that they were even superior to soap in their cleansing properties, and further in their manufacture to edible oil was used. They were manufactured from such inexhaustible materials as hydrocarbons. These hydrocarbons were obtained from crude oil which is pumped out of oil wells. They are what we now call petro-chemicals. To these hydrocarbons oxygen, hydrogen and sulphur are attached to form the soluble part of the molecule. Today the synthetic detergents comprise thousands of different compounds, with new ones discovered everyday. Mixed with foaming agents they form different types of shampooing material. These detergents are rapidly replacing soap. This has also meant a saving of millons of pounds of edible oil.

Properties. They are superior to soap in many ways. They are dry powdery substances easy to handle and if the clothes are kept in a solution of these detergents, the clothes only need a

little rinsing and hardly any hard washing. No greasy curds or rings are seen clinging to the tub or pan. It is immaterial to them what type of water is used whether it is hard or soft as these detergents are not effected by it. Manufacturers, to save the housewife further trouble and make washing pleasant, add blueing and foaming agents and some perfume. There is hardly a home in India now where these detergents are not used. They go under various names. Surf, Rinzo, Det, Persil etc., are the most familiar.

11

Laundry Equipment

The equipment required for laundering purposes is simple enough and is more or less indicated by the processes involved.

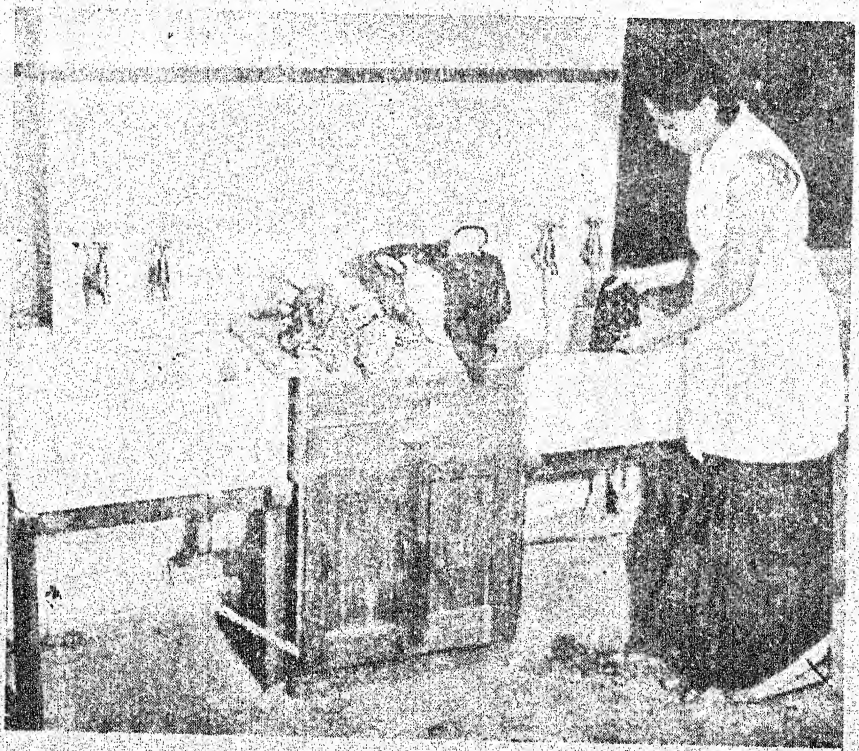


Fig. 72. Washing sink with draining board and attached cupboard.
(Courtesy Lady Irwin College)

Later in this Chapter, the equipment is described in detail. It would be very helpful to a housewife if she thinks out for herself

Fig. 73. Built in boiler. *(Courtesy Lady Irwin College)*

how many of these she is likely to need and in what sizes and quantities. She should, therefore, make a careful study of the articles enumerated below, and in the beginning, but only such as she herself thinks will be most necessary or helpful. Economy and care, particularly in the purchase of equipment, is essential

because it cannot be replaced without extra cost which, with a little thought, could be avoided.

Sink. It is very advisable to have a sink, as it very substantially reduces the amount of work, and labour involved in washing clothes. It should be so constructed in size and at a place and height from the floor, as will facilitate its use for washing clothes without causing much strain on the worker. Draining boards should be attached on to either side of the sink.

Boiler. Most of the household clothes such as table and bed linen etc., need boiling in order to disinfect them and to preserve their whiteness. Hence some arrangement for boiling is necessary. For a household, a small round tin of galvanized iron is quite sufficient. Failing this, a bucket can be used for small articles to be washed in the home. Heavy articles can be sent to the dhobi.

For institutional laundry, some permanent arrangement of a boiler as shown in Fig. 73 will be more serviceable and convenient. The material to be used should be hard and such as will not rust easily. Copper is most suitable. The size will depend on the amount of washing done, but it is advisable not to have a big boiler which will consume heat and so waste fuel. It will also be inconvenient for handling the clothes. It is heated either by means of coal 'angithi' or an electric or other stove or by a gas ring.

A pair of tongs fairly long or a wooden boiler-stick is necessary for moving the clothes in the boiler and for removing them. Electric boilers are also available in the market.

Tubs and Buckets. These are the most essential articles for laundry work as they are used for various purposes, *e.g.*, for steeping, washing, rinsing, blueing, starching and dyeing. Sometimes these are used as boilers also. In a household, a couple of these are quite sufficient but in an institutional laundry, the minimum number required would be about half a dozen.

The most suitable material for tubs and buckets is galvanized iron as it does not readily rust and is easy to clean.

Enamel Bowls and Basins. Enamel bowls and basins are utilized for several purposes in laundry. Medium size basins are used for washing small articles of silk and wool. These are also used for preparing starch, blue, and dyes. Small bowls are used for stain removal.

Spoons and Containers. Two or three wooden spoons are required for preparing starch, stirring blue, and for stirring dyes. One or two metal spoons may be included for handling the laundry materials. Containers such as bottles and jars are

needed for storing laundry materials. Metal containers are not advisable as these are liable to react with most of the reagents and so cause trouble.

Scrubbing Brushes. For washing very soiled articles such as *jharan* etc., hard bristle brushes are used.

Scrubbing Boards and Beaters. Dhobies wash the clothes by beating them against a stone. Sometimes a wooden beater is used by them. This weakens and shortens the life of the fabric. The use of a scrubbing board is an improvement on the dhobi's method of washing. In western countries, the scrubbing boards are made of corrugated zinc, wood

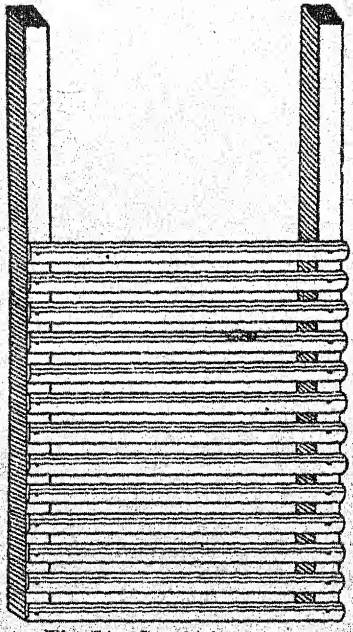
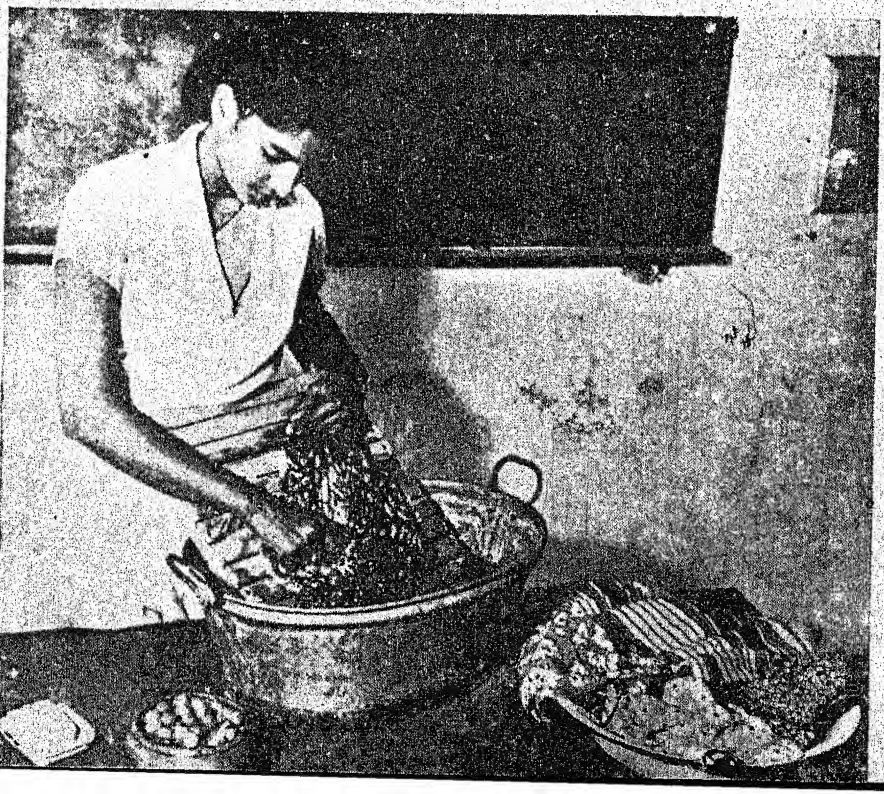


Fig. 74. Scrubbing Board.



or glass and are available in the market. Fig. 74 is the Lady Irwin College model, which is made of wood and is more serviceable. Fig. 75 shows a girl using a scrubbing board to wash a *khaddar kameez*. If an article is very soiled, a soft bristle brush may be used for scrubbing it. For heavy articles, a useful type of beater is a long wooden rod with a disc at one end.

Use of a Scrubbing Board. The use of a scrubbing board is very simple. A wash tub, half filled with water, is kept on a table 2½ ft. high (Fig. 75). The lower end of the board is placed in the tub. The article to be cleaned is made wet, spread on the board and soap is applied. The article is rubbed up and down on the board. Occasionally, it is dipped in the water to wash out the loosened dirt. The scrubbing board gives efficient work without harming the fabrics. Any cotton fabrics used for every day wear can be washed by this method.

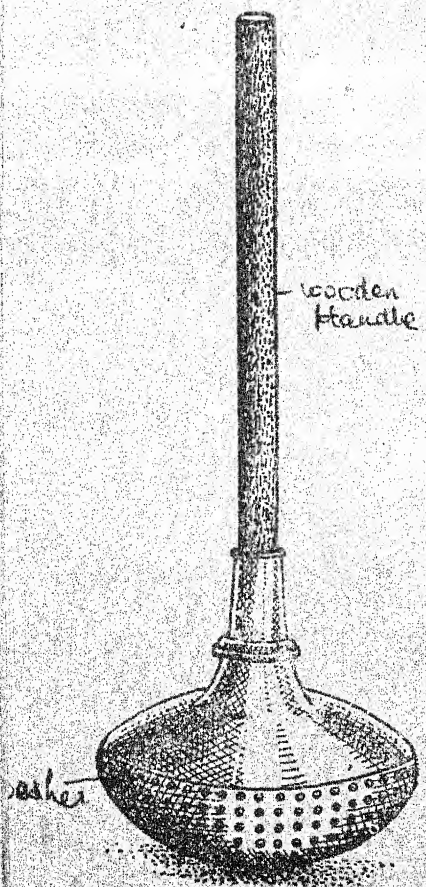


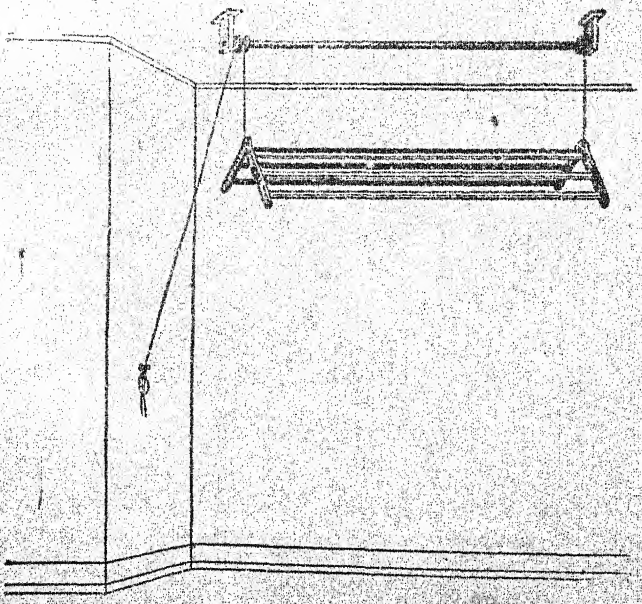
Fig. 76. Suction Washer

Suction Washer. This consists of two parts. The top part is the wooden handle and the bottom part is the washer. The washer is made of copper and is hollow inside with holes all over its lower portion. The choice of copper has no definite reason except that it is a good and durable material and does not rust easily. Zinc could also be used.

A suction washer is used for all types of fabrics, specially for those which need careful handling. All heavy woollens such as blankets, saris, suits, and even delicate fabrics such as laces, silks, and organdies, can be washed by suction washing.

Articles to be washed are immersed in soap solution in a tub or a basin; and the suction washer is worked up and down on clothes in the soap solution for 15-20 minutes until the dirt is removed (Fig. 77).

Fig. 77. Use of a Suction Washer.



Dryers. In India, out-door drying is possible almost all the year round. A fixed wooden rod is preferable to the ordinary clothes line. A strong hemp line kept and worked by a wooden winder and unwound in case when required, is also practical. Clothes pegs are essential and should be stored in a peg bag or box and kept free from dust and stains.

In places where the rains are heavy for three or four months or where enough outdoor space is not available, some arrangement of indoor drying will be essential.

Drying Rack. The usual practice is to hang a long bamboo stick or a wooden rod or a hemp or a metal line across the ceil-

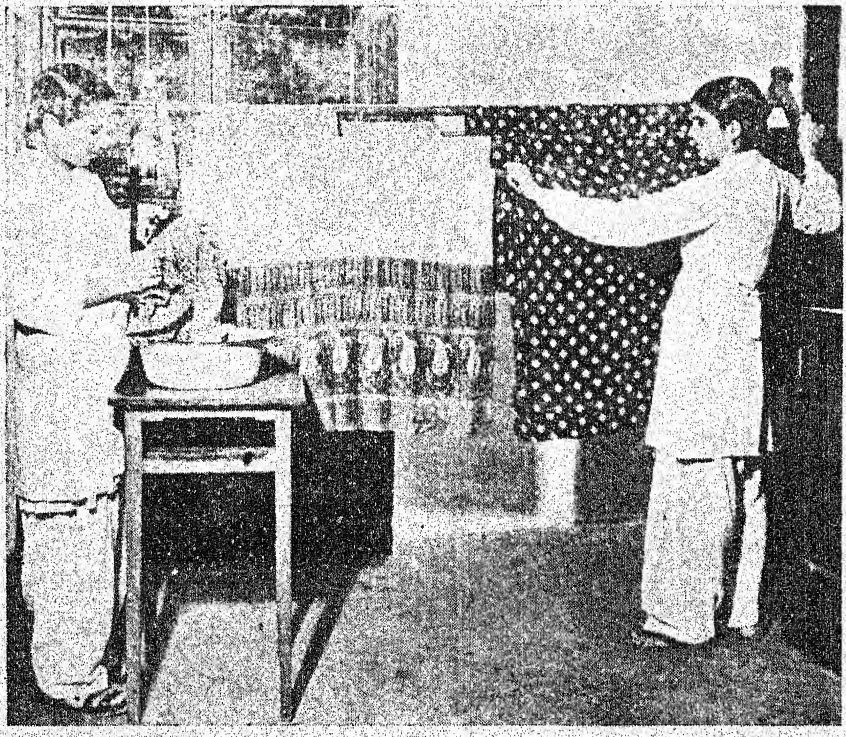


Fig. 79. Use of a Drying Rack.

ing in a room or in the passage of the house. Clothes are put on the wooden rod or lines with the help of a long bamboo. This method strains the muscles of the arms and the neck and thus tires out the housewife before the end of a job. A more practi-

cal and infinitely less tiring method is to use a drying rack (Fig. 78). It is made of wood. It consists of two frames and three to four pairs of rods. The rods are fixed to the frames on either side and then the whole rack is hung on pulleys. The advantages of this rack are that it can be lowered down to a convenient level so that a person can, with ease and efficiency, spread the garments on it to dry and then raise it back to the ceiling (Fig. 79). In big cities like Bombay, Calcutta, Delhi, where houses do not have a court-yard, outdoor drying is not possible, and a drying rack is most useful.

Dry Cleaning Pump. In western countries dry cleaning machines which are fairly small in size and can be used in the house are available, but such machines are not available in the Indian market, and a housewife has to send her clothes to the dry cleaners. When dry cleaning is attempted at home, open tubs or basins are used. But many of the dry cleaning reagents catch fire easily and also evaporate quickly, and so such an attempt is not free from risk. Dry cleaning at home is more of

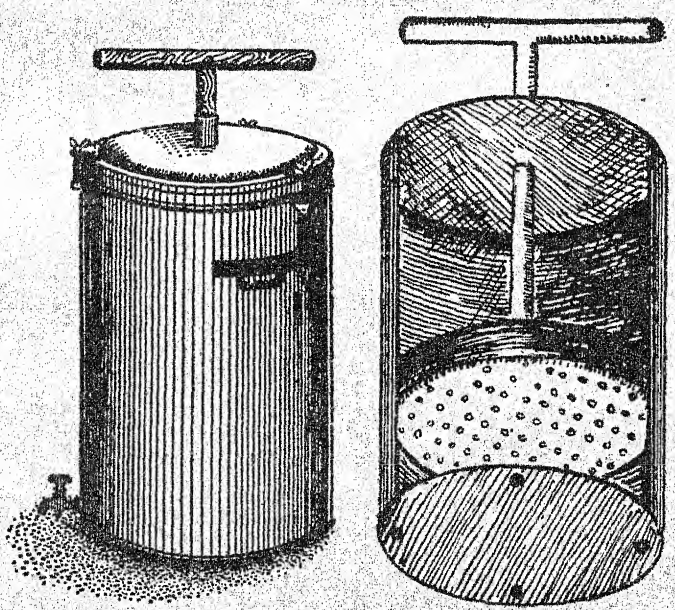


Fig. 80. Dry Cleaning Pump.

a waste than economy. The grease solvents such as petrol and benzine, which are used for dry cleaning, are volatile and most

of these are lost in evaporation when used for dry cleaning in an open basin or a tub. The "Dry cleaning pump" will save petrol as well as give efficient work. The "Dry cleaning pump" is a round tin with a lid, a tap at the lower side and fitted in suction washer with a handle. The lid is tightened up by means of three screws which makes the tin almost airtight (Fig. 80).

When using, the tin should be half filled with petrol, the dirty articles placed in and the lid screwed down. The suction washer is worked up and down by means of a handle for 15 to 20 minutes. Time depends on the amount of dirt in the garment. At the end of the process, the tap is opened and the petrol is received in a bottle through a filter paper. Then the lid is unscrewed, and the articles removed from the tin and left to air.

The whole apparatus should be made of some rustless metal. A wooden handle to the suction washer is more convenient.

FINISHING APPARATUS

For ironing, the necessary articles are irons, ironing boards, ironing tables, sleeve boards and coverings for these.

Irons. There are various types of irons available in the market to meet the requirements of the kind desired, such as :—

Flat, Charcoal, Electric and Thermostatic. In India, charcoal irons are much in use. In big cities, electric irons are very popular in the homes. Flat irons are also in use.

Charcoal Irons. A charcoal iron consists of a metal hollow box, with a handle at the top (Fig. 81). A few pieces of live charcoal are placed inside along with some fresh charcoal and then the iron lid is closed ; the draught door at the back is left open to allow the charcoal to continue burning and so heat the iron. The iron has to be necessarily large to hold sufficient charcoal to give continuous heat, and so it is difficult to manipulate. Another drawback of this iron is that the ash from the coal is likely to fall out and spoil the clothes.

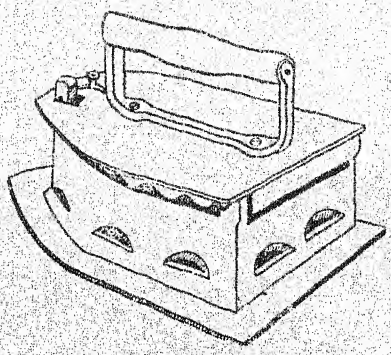


Fig 81. Charcoal Iron.

Flat Irons. These vary in size and weight, which are marked

on the iron, small sized irons are useful for small articles. They are made of iron and the numbers on the iron indicate their sizes, and the weights are approximately the same in lbs. as the number. The sizes from three to six are used for general household ironing. The sizes beyond six are heavier and are used for heavy linen. These are better than charcoal irons, if a suitable heating arrangement is made. The easiest and a clean heating method is to put a small piece of iron sheeting or a *tawa* on a coal *angithi* or a gas fire and to place the iron on it. The gas or charcoal fire will heat the iron sheet and eventually the iron placed on this hot sheet will be heated. If this iron is heated by placing directly on the live coals or gas flame, it necessitates a thorough cleaning every time it is heated, which is inconvenient and also involves the risk of scorching the cleaner's fingers.

Electric Irons. These are available in various weights and designs. They have nickel or chromium surfaces which are rustless, hence need no cleaning. These are most convenient to use because of their quicker and cleaner heating property and also because of their smooth and bright surfaces, which make ironing easier and more satisfactory. Some electric irons are provided with a thermostatic control or a heat regulator by means of which the current switches off when ironing temperature is reached and automatically switches on again as the iron cools. Some irons have control switches on the iron itself, so that the heat can be regulated for different fabrics. Some irons even have arrangement for producing steam and spraying it on the clothes as you iron them. Others are specially made and shaped for various purposes such as pleating and ironing round buttons.

The worker should be careful in using an electric iron. She should regulate the heat by switching on and off the current. She should guard against its falling down as it will either damage the element or the connection. The element is the coil of wire which is placed just above the metal base of the iron. The element receives the electric current and supplies the heat to the iron. The flex or the wire attached to the plug should be free of loops or kinks during use. No strain should be placed on it, or the fine wires may break near the connections, and cause a short circuit, the result of which will be the burning out of the flex at the point. This is less likely to happen if the flex comes from above the worker. If the plug of an electric iron is so low that the flex comes from below the worker, the flex should be

long enough to allow of its being placed over a hook higher than the worker, and the coming down from the hook to the hand level. An alternative is to have a flex holder clamped on to the edge of the ironing table.

Cleaning of the iron should be done while the iron is hot. Tie a piece of wax in a rag and rub hard on the surface of the iron. Avoid use of any abrasive powder, and when any such powder is used, apply a paste of it made with oil free from grit and then polish it off.

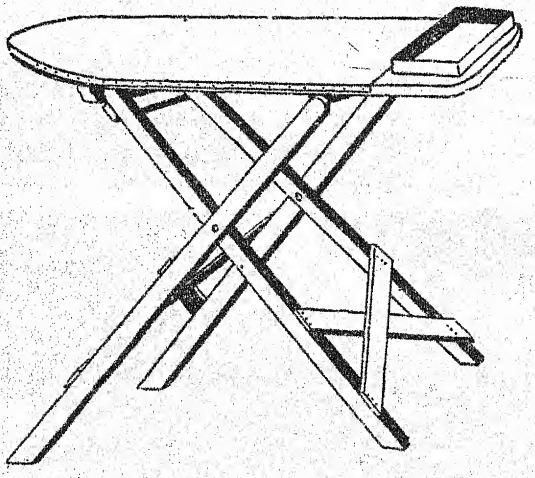


Fig. 82. Ironing Board.

Fig. 83. Sleeve Board.

Ironing Boards. It will very much facilitate ironing, if ironing boards (Fig. 82) as well as sleeve boards (Fig. 83) are available. They are all padded with flannel and when in use are covered with a white linen cover (made out of an old sheet) stretched taut and smooth. All these boards vary in style and size and are made of wood. They are collapsible, easy to be moved and when not in use do not need much storing space. These are also known as skirt-boards.

A useful and neat device is to have an ironing board cabinet let into a wall of the room from which the boards can be

projected out for use (Fig. 84). When closed, it would look like an ordinary cupboard or almirah let into the wall.

It is of course obvious that in the absence of ironing boards any flat smooth surface, *e.g.*, the top of any table or even the floor can be used. Indeed, for saris, the latter might be more

Fig. 84. Ironing Cabinet.

convenient. All that is needed is a fairly thick rug or blanket (or even two) spread smoothly with a clean sheet on top.

12

"Cotton and linen"

Cleansing Materials and Other Reagents

There are a number of other cleansing agents available in the market. Some give very good results while others are not so good. Some are cheap, others are expensive. A housewife, therefore, should make a study of the materials and reagents and find out the most suitable ones for her purpose before she makes purchases for her laundry store.

A list of cleansing and other reagents that are required for laundry work is given below, with instruction for their use.

Petro-Chemicals. There are a number of synthetic substances that are new used as cleansing agents chief amongst them is *tinopal*. This is used on white clothes. It is a cream coloured powder.

Method of using. The cloth is first washed in the usual way and then kept in a solution of tinopal in water for half-an-hour. The colour of the cloth becomes beautifully white. Only one table-spoonful of the substance is to be added to a bucket full of water and this solution is sufficient for about dozen clothes. It is very good for any white cloth—nylon, cotton linen etc. etc.

Rita Nut. Rita nut is a fruit of a big tree which grows abundantly in Bengal and in South India. The extract of the outer kernel of the nut has cleansing properties. It gives a free lather with hot water. It is more suitable for silk than for cotton and woollen fabrics, because in the latter case, the cleansing action is not so effective. Dry rita fruit is obtainable in the market. It is cheap and within the means of the poor people

who cannot afford to purchase more expensive neutral soaps.

Method of using. Stone the nut and use the kernel. Make the solution with about 8 oz. of rita kernel soaked in two pints of boiling water, for 8-12 hours ; stir and strain through a cloth. Mix sufficient solution with cold or hot water to get a good lather, stir briskly till a good lather is formed. Wash the article in this lather by kneading and squeezing method. Rinse first in plain warm water to eliminate the rita solution. Then rinse again in fresh cold water to freshen the colour.

Shikakai. It is the fruit of a tree grown in South India and is very popular as a hair shampoo. This can be used in the same way as the rita nut. But, it is not quite as effective a cleansing agent as the rita nut is for clothes.

Soaps and Soap Solutions. It is cheaper and more economical to buy soap in large quantities. Remove the wrapping, cut up the household soap into suitable blocks and store them in a cool dry and well-ventilated room.

The soap stock should consist of soap flakes, soap chips or grains and bar soap. Soap flakes are good for expensive silks and woollens. Soap chips and bar soaps are for general use.

Detailed instructions about the quality of good laundry soaps are given in Chapter 10.

Soap Solutions. Soap solution is generally made by mixing about 4 oz. of shredded soap in 1 pint of water.

Place the shredded soap in a pan and pour water over it. Heat the soap solution slowly to avoid its boiling over, till the flakes have dissolved. Remove the pan from the fire and bottle the solution when cooled. The solution is used for making a permanent lather, in washing water, for all types of cleansing, other than friction washing.

CLEANSING FLUID

Recipe. 6 parts shredded soap (bar soap or Sunlight)
4 ,, ammonia
2 ,, glycerine
4 ,, methylated spirit
100 ,, water

Method. Dissolve the shredded soap in water over a fire, remove the solution from the fire, allow it to cool ; then add the remaining ingredients. Keep this cleansing fluid in a stoppered bottle. This is used like the soap solution for making a permanent lather in water. It is particularly good for washing

silks, woollens, and also for rinsing any fabric after stain removal, so as to get an even, clean surface.

SOAP JELLY

Recipe. 1 part soap (bar soap or Sunlight)
5 parts water.

Method. Shred the soap, add water and dissolve the soap slowly over the fire. Stir well. Continue heating on a slow fire till a jelly like consistency is obtained. Cool and store in a jar. Use in the same way as soap solution.

Soap Powders. Many soap powders are advertised for laundry work, but their suitability depends on their composition. They usually consist of some soap and alkali, such as sodium carbonate or washing soda or sodium perborate. Washing powders help in cleansing grease readily because of the alkali, but the drawback is that excessive alkali may damage the fabric. Therefore, a housewife should purchase soap powedr of a well known brand.

Sulphonated Fatty Alcohols (S.F.A. Powders). These are known as S.F.A. powders. They are similar in appearance as soap powders, and are available in the market as soap substitutes. They give a fine lather in cold or tepid water, and even in hard water without the formation of a scum. These are non-alkaline and, therefore, are particularly suitable for woollen and coloured fabrics, which are sensitive to alkali or heat. But for their cost, they would have been an improvement on soap.

Bran Solution. Bran is the outer skin of the wheat grain. It contains a certain amount of starch, gluten, and vegetable and mineral salts. The extraction in water is non-alkaline and has cleansing action. It preserves the colour, as it contains mineral salts. So, bran solution is used for cleansing articles of uncertain dyes. To increase the cleansing action, some shredded soap is sometimes used in the preparation of bran solution.

Recipe. Put 1 part of bran in 4 parts of water. Place bran and cold water on a fire and heat the mixture in an old pan, till it boils. Let it simmer for half an hour. Strain through a muslin and bottle the solution. Dry the bran and keep it to be used once again.

Use. Add sufficient bran solution to water to produce a soapy feel and wash the articles by kneading and squeezing. If the articles are very dirty, use about one table spoon of shredded soap with the bran in the preparation of bran solution.

SAL-AMMONIAC (AMMONIUM CHLORIDE) SOLUTION

Recipe. Dissolve 1 table spoonful and sal-ammoniac (naushadar) with boiling water in a basin, add hot or cold water to make up one gallon of warm solution.

Use. It is used for woollens, serge and heavy curtains. Shake the garments to remove the dust. Examine them for stains and brush the spots with solution. Place them in a basin containing solution for 10 to 15 minutes. Squeeze gently. Rinse well in warm water.

GLUE WASH

Recipe. Soak one ounce of glue in half a pint of cold water in a jar, for 12 hours. Stand the jar in the pan, containing boiling water to melt the glue. Add the melted glue to half a gallon of warm water.

Use. It is suitable for gaberdines, serge and blankets. Examine the articles for stains. Remove all grease stains as glue wash will not remove them. Steep the articles in the hot solution for half an hour. Stir, knead and squeeze every five minutes. Rinse several times in hot water.

PARAFFIN WASH

Recipe. 2 gallons (9 litres) hot water.
1 oz. (28·3 gms.) washing soda.
2 oz. (56·6 gms.) of shredded soap (Sunlight soap)
2 table spoons of paraffin.

Method. Place washing soda, soap and water in a basin or a pail, and heat till the soap dissolves and the water reaches the boiling point. Remove from the fire, cool slightly, add paraffin and stir. Wet the clothes and place them in the wash, press to ensure proper soaking of the clothes in the solution. Return to the fire and boil them for half an hour. Stir occasionally with a wooden rod. Rinse thoroughly in hot water several times. Dry in open air to get rid of the paraffin smell. This solution is of specific use for dirty articles soiled with grease.

STIFFENING AGENTS

Starch is well-known stiffening agent used in laundry work for cotton and linen fabrics. Gum and gelatine are the stiffening agents used for silk.

A certain amount of stiffness in the washed clothes gives them a smooth glossy surface, which is resistant to dirt and dust. The stiffness, however, must not impair the pliability of the garment

too much. This is ensured by using only such starch solutions as can penetrate the fabric and not coat its surface. The housewife will know what are the appropriate varieties to be used from the detailed description given below.

Suitable starches are stored by nature in the stems of certain plants (*e.g.*, palms) but more often in grains or seeds (*e.g.*, rice, wheat, maize etc.) and in roots and tubers such as potatoes, sweet potatoes, arrowroot etc. Starch is a carbohydrate and the physical appearance of the starch from all these different sources is very much the same. Even chemical tests are not helpful in distinguishing one from the other. But these differ a great deal, so far as the character of the stiffness imparted to the fabrics by their solutions is concerned. Only a microscopic examination of the grains reveals the fact that they differ in shape and size.

Rice Starch. These starch grains are the smallest and make a viscous solution which is suitable for stiffening the fabrics. It gives sufficient stiffness with pliability. This starch is suitable for cold water starching as the size of the grains is small enough to effect an easy penetration into the fabric.

Wheat. The starch grains are of two sizes ; large and small, and give a strong viscous solution which also produces stiffness with pliability in the fabric. But it is very expensive and so it is not economically useable in laundry work.

Maize. This starch gives a strong viscous solution but produces undesirable stiffness which feels rough to the touch. It is cheap and may be used after blending with other starches.

Potato. These starch grains are very big and so it is not suitable for laundry purposes.

Commercial Starches. Various brands of commercial starches are available in the market. These are usually manufactured by blending two or three different kinds. Colman's starch has been in the market for a number of years and gives satisfactory results.

'*Dip*' is one of the latest stiffening agents in western market. It is a synthetic product. The chief advantage of this product is that it gives a stiffening which lasts even after the fabrics are washed several times.

Note. All starch grains rupture on the application of heat and moisture and form a colloidal solution. Therefore, in the preparation of the solution with hot water, care should be taken to use the water at boiling point. This bursts the outer covering of the granules which then gelatinise and give the starch the jelly-like appearance.

But, a starch solution can be made with cold water also and is used when extra stiffness is desired in a garment, *e.g.*, shirt fronts, collars, cuffs etc.

PREPARATION OF BOILING WATER STARCH

Recipe. 1 table spoon starch.
2 table spoons cold water.
1 pint boiling water.
½ tea spoon borax.
¼ tea spoon wax.

Method. Mix the starch to a smooth paste with cold water in a basin. Add borax and wax. Pour over the boiling water quickly, stirring all the time till a colour change takes place, which shows that the starch grains have burst and a colloidal solution has been formed. This is the full strength starch. It should be diluted immediately by adding to it an equal volume of cold water. If it is allowed to remain without dilution, it will form a solid lump as it cools.

Use. The starch must be dried well in the fabrics. Then the fabrics are damped evenly before ironing to get good results.

COLD WATER STARCH

Recipe. 1 table spoon of starch.
1 table spoon of boiling water.
½ tea spoon of borax.
¼ tea spoon of wax.

Method. Place the starch in a basin. Dissolve the borax and wax in boiling water and add to it the starch in the basin. Then add the cold water and stir the mixture. Strain through a muslin. Cover and leave it for half an hour before use. This allows the starch grains to soften. Stir thoroughly before use.

Use. The article to be cold-water-starched must be dry. Knead and squeeze the dry article in the starch mixture. Squeeze out. Rub off the surface starch grains with a wet muslin. Iron immediately. It is important to have a clean, hot iron and also to use quick movements of the iron. This starch gives stiff effect and so is used for thin muslin articles, collars, cuffs, shirt fronts, frills etc.

The strength of the starch used depends upon two factors :

1. The thickness of the fabric.
2. The stiffness required in the article.

Thin texture fabrics need heavy starching, whereas the thick fabrics need light starching. Full strength starch is, therefore, diluted with cold water to the required strength.

Table showing the strength of starch for different articles

Full Strength of Standard Starch	*Cold Water*	*Articles (Cotton and Linen)*
1 part	1 part	Caps and hats.
1 part	2-3 parts	Table mats, cotton dupattas, cuffs, tray cloth, damask table cloth.
1 part	4 parts	Thin curtains, blouses (thin), table napkins, salwars.
1 part	5 parts	Thick curtains, thin blouses. aprons.
1 part	6 parts	Blouses, saris.

RICE STARCH

Recipe. 1 table spoon of rice.
1 cup of water.
½ tea spoon of borax.
¼ tea spoon of wax.

Method. Boil the rice in the water till it is thoroughly cooked. Then, rub through a muslin to get a smooth paste. Dissolve borax and wax in boiling water and add it to the strained rice mixture. The starch is now ready.

Use. Dilute the prepared starch with cold water and use it as a hot water starch.

Note. Addition of borax and wax to the laundry starch will whiten and freshen the clothes. Borax gives whiteness, and wax gives glossiness.

Gum Water. It is a preparation made with gum-arabic, a gelatinous fluid from the tropical acacia tree, which dries by exposure to the air. Gum water is used for stiffening silks and rayons.

Recipe. 4 oz. of gum-arabic.
1 pint of water.

Method. Soak the gum in the water overnight in a jar. Stand the jar in hot water to dissolve the gum. Stir occasionally. Strain through a muslin and bottle.

Use. Rinse the articles in water to which the gum water is added in the proportion of a tea spoon to half a pint of water. Stir the water well before putting in the article.

BLUE

Blue is used in the last rinse for bleached cotton and linen. Bleached fabrics after wear and washing lose whitness and get a yellowish tint. To counteract this yellowness, its complementary

colour, blue, is used and the whiteness is restored.

It is obtained from chemical, vegetable and mineral sources and in the form of powder, liquid, balls and cubes. The colour varies according to the sources from violet to blue or from greenish blue to bluish green. They also differ in their solubility. The chemical blues such as the coaltar dyes are completely soluble.

TYPES OF BLUE

Ultra Marine Blue is generally used in laundry. It was originally a mineral substance but now it is known to be manufactured from soda ash, sodium sulphate, charcoal, sulphur and clay. All these are heated and then ground. It makes a fine powder and thus becomes a suitable blue for laundry. It is safe to use as it is not harmful to the fabrics. It gives a violet blue colour and is available in the form of powder, cubes and balls.

Prussian Blue. This is ferric ferrocyanide. It was discovered in the eighteenth century. It is a mixture of iron sulphate with potassium ferrocyanide. It is not very suitable for use, as it is likely to leave rust marks on the fabric after ironing.

Indigo. This is directly prepared from the leaves of certain plants, and is not manufactured synthetically. It is expensive and is not very much used in laundry. It has a dull blue colour which is not very suitable.

Aniline Blue. This is made from coaltar dyes. This colour may vary from purple to blue. It is of two kinds, one gives best results in an acid medium, and the other in an alkaline medium. This is readily soluble and is, therefore, the best to use in laundry. Indigo and ultra marine are not completely soluble in water and remain in suspended particles. Suspended blues will not give an even colour to the fabrics ; besides, the particles may stick to the cloth and thus leave marks.

Method. About a tea-spoon of blue should be tied in a piece of muslin. This should be shaken in the water to be used for the last rinse till it becomes the desired shade of blue.

TESTS FOR THE DEPTH OF COLOUR IN BLUEING

1. Take some of the blue in a glass, hold it up against the light. The colour should be a pale blue.

2. Dip a piece of white rag, test the colour to see if it is even and pale.

3. Take a little solution in the palm of the hand and note the shade. The colour should be pale blue.

Too much blueing will give the cloth a dull greyish colour and will make the white cloth unattractive.

Use. Every time an article is put in the blue water, the water must be stirred thoroughly. The article must be opened out before being put in, otherwise, patches will form as the blue settles on the cloth instantly.

If the article has taken on a deeper shade than desired, it must be rinsed immediately in another bucket or tub of water to which a little vinegar has been added. This will lighten the colour.

OTHER LAUNDRY REAGENTS AND BLEACHES

Washing Soda, or **Sodium Carbonate,** is used a great deal in laundry work. It is an alkali and is used in the boiler for softening water, to emulsify grease, and to counteract the effect of acids. To remove acid stains from bleached cotton and linen, a solution of one table spoon to one pint of water is used.

Borax (*Sohaga*) is a very much milder alkali than washing soda. It can be safely used in the treatment of animal fabrics. It prevents wastage of soap by neutralising acid substances in new woollens, silk articles, and the perspiration absorbed in body linen, hence, it is used in steeping water for very soiled articles. It has some bleaching action, and therefore, it is used to bleach cotton and linen fabrics yellowed by age. Borax is also used in starch for giving a bright finish to the fabrics.

It is a mineral product and is sold in powder form. It is not soluble in cold water, and, therefore, hot water is used to make a solution (one table spoon of borax to 1 pint of hot water).

Rock Ammonia (Ammonia Carbonate) is a mild alkali and can be used as a substitute for borax in washing new woollens.

Oxalic Acid. This occurs naturally in plants such as sorrel and rhubarb. It is also prepared commercially by treating saw dust with caustic soda to give sodium oxalate. This is decomposed with lime to give calcium oxalate, which is again decomposed with sulphuric acid to give oxalic acid. It is used to remove stains of iron rusts and ink, and also to clean straw bats. It is *poisonous* and the jar containing it should be labelled such. A solution of one table spoon to one pint of water is made in a wooden, enamelled or glazed vessel, as it wears the metals.

Salts of Lemon. This salt is produced by the action of oxalic acid on potassium. It is acidic in nature and is used to remove similar stains treated by oxalic acid. It is also poisonous and should be stored in safe place with a special label on it.

Acetic Acid is a bye-product of the distillation of wood. It is extracted from the liquid distillate by treating it with hydrochloric acid. It has the characteristic smell of vinegar. A few drops used in the final rinse of coloured fabrics, especially silks, brighten the colour and improve the sheen of the material. It also has the action to decompose ultra marine blue and may be used to remove overblueing if necessary.

Vinegar is produced by the fermentation of sugar with yeast. It is the most satisfactory solvent for medicine, varnish and grass stains. It can also be used in place of acetic acid, as it contains 6% of acetic acid.

BLEACHING AGENTS

Bleaching means the process of removing colouring matter from fabrics. In laundry work, it is more or less limited to the removal of stains.

Bleaching agents are of two kinds :—

(*a*) **Oxidising bleaches.** These have oxygen as a chief component which is liberated and on contact with the stain, forms a colourless compound.

(*b*) **Reducing bleaches.** These remove the oxygen from certain kinds of stains and so, reduce them to a colourless compound.

Oxidising bleaches. Amongst the oxidising bleaches, the following may be mentioned :—

1. *Sunlight with moisture, air and grass.*
2. *Sodium Hypochlorite.*
3. *Sodium Perborate.*
4. *Hydrogen Peroxide.*
5. *Potassium Permanganate.*

Sunlight with moisture, air and grass. This is the oldest, the easiest, the cheapest and perhaps the best method of bleaching cotton and linen, and of removing colouring matter, which on contact with oxygen becomes colourless. The oxygen from the air and grass liberated by the sunlight and in conjunction with moisture is the active bleaching agent.

The article, particularly the stained part, must be moistened and exposed to the sun preferably on grass, or shrubs or plants. When it is nearly dry and the stain is still there, moisten it again. Repeat the process until the colouring matter is gone, after which the fabric must be removed immediately. Otherwise long exposure to the sun will weaken it.

Sodium Hypochlorite or *Javelle Water.* This can be easily prepared and stored in the laundry cupboard for use :

Recipe. 1 lb. washing soda.
2 pints boiling water.
½ lb. chloride of lime.
4 pints cold water.

Method. Make a solution of washing soda and boiling water. Mix chloride of lime with cold water. Stand the mixture for sometime, so as to settle down. Decant the clear liquid, and add it to the washing soda solution. This will give sodium hypochlorite and calcium carbonate which will precipitate. Allow the precipitate to settle and then strain off the clear liquid. This must be always stored in coloured bottles as it deteriorates in the light.

Use. Sodium hypochlorite is a strong bleaching agent and can be used only on white cotton and linen. Dilute it with an equal quantity of hot water and sponge the stained portion with it until the stain is removed.

Sodium perborate is also used as a bleaching agent. It is manufactured by mixing solutions of borax and caustic soda with hydrogen peroxide. When mixed with warm water, it gives off oxygen and also forms an alkaline solution of hydrogen peroxide. For this reason, it is an effective bleach. Sodium perborate is used in the preparation of soap powders, but the bleaching action of these powders is not very effective unless the fabrics are boiled in the soap powder solutions.

Use. Make a solution of sodium perborate in the proportion of one tea spoon to one pint of boiling water. Sponge the stain with a thin solution. This is mostly used for removing stains from white linen and cotton.

Hydrogen peroxide is a safe bleach for silks, woollens and rayons as it has no harmful effect on animal fibres. It is marketed in the form of a solution marked "10 volumes" or "20 volumes". This means that one part of hydrogen peroxide

provides 10 or 20 parts of oxygen. In action it splits into water and oxygen rapidly if the solution is made alkaline by the addition of washing soda or ammonia ; but the splitting up is slow if the solution is acidic. Hence, it is sold as a slightly acid solution. Like the oxidising bleaches, it has an effect of weakening or even rotting the fabrics if kept in contact with it for a long time. Hydrogen peroxide should never be allowed to dry in the fabric.

Use. It can be used on all types of fabrics. The 10 volume strength can be used without dilution for white linen and cottons, but for other fabrics, it should be diluted by adding six parts of cold water to one part of hydrogen peroxide.

Potassium Permanganate is used as an oxidising bleach as it has a high content of oxygen. It is used in laundry chiefly for removing stains caused by dyes, mildew, perspiration and marking ink. A brown colour is left in the fabric which can be removed by treating it with hydrogen peroxide or oxalic acid. Potassium permanganate is available in the form of crystals and can be easily stored in a bottle.

Method. Make a solution of potassium permanganate in the proportion of ½ tea spoon of potassium permanganate to 1 pint of water.

Use. Steep the stain in this solution and then in the solution of hydrogen peroxide[1] or oxalic acid[2]. Repeat this process till the stain is removed.

(*b*) **Reducing Bleaches.**

Sodium Hydrosulphite. This is sold in powder form. The powder is anhydrous (free from water). When dissolved in water it readily absorbs oxygen to form sodium metabisulphite. Further, sodium metabisulphite by absorbing oxygen forms sodium sulphite and sulphur dioxide. The sulphur dioxide gets oxidised to sulphuric acid and this gives out hydrogen. Thus, the removal of stain is brought about in two ways. First, the powder takes away oxygen from the stain, thus breaking up the composition of the colouring matter, and secondly, hydrogen, given off by sulphuric acid, removes the broken up components of the colouring matter.

[1] The 10 volume hydrogen peroxide should be diluted in the proportion of 1 part of hydrogen peroxide to 6 parts of cold water.

[2] Oxalic acid should be diluted to 1 part of acid to 20 parts of warm water.

This is used when the stains have not yielded to oxidising bleaches. It can be safely used for all kinds of fabrics with the precaution that the temperature of the solution is suited to the fabrics.

Use. Dilute it in the proportion of ½ oz. of sodium hydrosulphite to 2 pints of water and sponge the stains with the solution.

GREASE REMOVERS

Grease-removers fall into two groups, according to the way in which they act. One group is known as *Solvents* because they dissolve the grease and thus facilitate its removal. The second group is known as *Absorbents* because they absorb the grease and thus remove it.

(*a*) **Grease Solvents** are liquid in form. Petrol, benzine, acetone, turpentine, paraffin, methylated spirit, may be classed under this group. They are obtained from shale oil or petroleum excepting benzine, which is obtained from coal-tar. They differ in their ranges of boiling points. But it must be remembered that they are inflammable. Petrol, benzine and methylated spirit are equally inflammable and spread rapidly. So, care must be taken not to use them near an open fire or a naked light.

(*b*) **Grease Absorbents** are dry and powder like. Bran (outer cover of the wheat grain), Fuller's earth, French chalk fall under this group.

Bran is heated before its use as an absorbent.

Fuller's earth is a natural clay and is obtainable in natural or bleached form.

French chalk is mainly magnesium silicate. It is white and its action is similar to Fuller's earth. It is obtainable in perforated containers.

13

Stain Removal

Stain is a spot or mark of discolouration left on fabrics by the contact and absorption of some foreign substance. Some stains are easily removed by ordinary methods or reagents. But there are quite a few, which need special treatment. This entirely depends on the nature of the stain. One therefore must be familiar with the appearance of many of the common stains such as general soil, ink, fruit, sugar, grease, grass marks, tar etc., etc. A clue to its identity is often provided by the appearance, feel, smell, and colour of a stain. Stains, therefore, have to be classified according to the substance that causes them. Broadly speaking they can be divided into (*a*) Animal, (*b*) Vegetable, (*c*) Grease, (*d*) Dye and (*e*) Mineral.

Animal stains are those caused by blood, egg, milk and meat juice. As these contain protein matter, heat must be avoided in removing them, otherwise, the protein matter will get fixed in the stain.

Vegetable stains include those caused by tea, cocoa, coffee, fruit and wine. These are acidic and, therefore, require alkaline reagents to remove them.

Grease stains may be just grease spots or some colouring matter fixed with grease. These include butter, curry, oil-paint, varnish and tar stains. In removing these stains, some grease solvent or an absorbent is first used to dissolve or absorb grease before the removal of the colouring matter. A solvent soap is also very effective for removing these stains from washable fabrics.

Stain	*Condition*	*White Cotton and Linen*	*Coloured Cotton and Linen*	*Silk and Wool*	*Synthetic Fabrics*
Beverages					
Tea, coffee fruit and wine	Fresh	Pour boiling water through	1. Steep in warm water. 2. Steep and dilute borax solution (½ teaspoon to 2 cups of water).	Same as coloured cotton.	Steep in warm sodium perborate solution. (1 tea spoon—1 pint)
Ditto	Dry	1. Spread borax over and pour boiling water through. 2. Steep in glycerine, until stain is removed. If it still persists bleach with javelle water.	1. Repeat above method. 2. Steep in warm water. Apply glycerine and rub. Repeat till stain is removed.	1. Steep in borax sol. 2. Treat with dilute hydrogen peroxide.	Ditto
Note :—For cocoa, if the above methods are not successful, apply benzine on the stain. Place the stain in between a blotting paper and press it.					
Blood (Protein)	Fresh	Soak in cold water, then wash in dil. ammonia.	Soak in cold water, then wash in dil. ammonia.	Sponge with cold water.	Wash in cold water.
Ditto	Dry	Steep in cold water and salt until stain is removed. (1 oz. to 2 pints)	Same as white cotton.	Same as white cotton. For unwashable fabrics apply starch paste. Leave it to dry. Repeat treatment, if not removed.	
Butter (grease and colouring)	Fresh	Wash with warm soapy solution.	Same as cotton.	1. Treat with solvent soap. 2. Cover the stain with French chalk, place the stained portion between clean blotting paper. Iron with a hot iron.	Cover the stain with French chalk. Place the stained portion between clean blotting paper. Iron with a hot iron.
Catachu (Katha or betel-leaf spots).		Apply dil. pot. permanganate solution, then sodium bisulphite, wash.			
	Dry	Treat with solvent soap (Chapter 10).	Same as cotton.	-do-	-do-
Curry (grease and haldi). *Note.* Treat immediately.		1. Wash with soap and water. 2. Bleach in sunlight and air. 3. Bleach with javelle water.	1. Treat with solvent soap. 2. Fast colours to bleach in sunlight and air. 3. Treat with 10% potassium permanganate solution followed by 8% sodium bisulphite solution.	1. Treat with solvent soap. 2. Treat with potassium permanganate and ammonia. Dip the stained portion alternately in the above solutions.	1. Wash with soap and water. 2. Bleach with sodium perborate.
Dye		1. Steep in water. 2. Wash with soap and water. 3. Steep in dilute alkali or dilute acid. 4. Treat with alcohol, ammonia and dilute acetic acid. 5. Steep in cold solution of bleaching powder.	1, 2, 3. Same as cotton. 4. Treat with alcohol, ammonia and dilute acid. 5. For fast colours.—Bleach with bleach-	1. Treat with alcohol or ammonia. 2. Bleach with hydrogen peroxide.	1. Wash with water and soap. 2. Treat with dilute bleaching powder solution.

Stain	*Condition*	*White Cotton and Linen*	*Coloured Cotton and Linen*	*Silk and Wool*	*Synthetic Fabrics*
		(1 oz.—2 pints of water. 6. Bleach with javelle water.	ing powder solution or quick treatment of javelle water.		
Egg	Fresh	Wash in cold water and then in warm water and soap.	Same as cotton.	Same as cotton.	Same as cotton.
	Dry	Apply salt and pour warm water through.	Soak in salt solution until stain is removed.	Steep in salt solution.	Steep in salt solution.
Fruit and wine.	Fresh	1. Cover the stain with starch paste and leave it for one hour. Rub off the starch and pour boiling water through.	1. Soak in warm borax solution. 2. Soak in warm salt solution.	Same as for coloured cotton.	Steep in warm sodium perborate solution as for tea stain.
	Dry	1. Spread borax or salt over the stain and pour boiling water through. Repeat till stain is removed. 2. Bleach with javelle water.	Sponge with dilute potassium permanganate solution, then immediately apply a mixture of one part of acetic acid, one part of hydrogen peroxide and two parts of water. Repeat the process till the stain is removed.	Same as coloured cotton.	-do-

Grass		1. Steep in methylated spirit. 2. Wash with soap and then H_2O.	Same as white cotton. -do-	Same as white cotton. -do-	Steep in kerosene.
Grease, Oil and Ghee.	Fresh	Wash with hot water and soap.	Same as white cotton.	If washable same as cotton.	
	Dry	Treat with a grease solvent, and wash with hot water and soap.	-do-	For unwashable, treat with a grease absorbent. Spread french chalk or fuller's earth on the stain. Leave it for one hour. Brush off the powder.	Same as for silk and wool.
Candle grease.	Solid	1. Scrape off as much as possible with a blunt knife. 2. Place the stain in-between a blotting paper, and press it with a hot iron. Sponge with benzine.	Same as cotton.	Same as cotton.	Same as cotton.
Haldi.		Refer to curry stain for treatment.			
Henna (Mhendi)		Dip in warm milk for half an hour, then wash with soap.			
Ice-cream and chocolate.	Fresh	1. Wash in cold water and soap. 2. Steep in warm borax solution. 3. Sponge with petrol or carbon tetrachloride.	Same as white cotton.	1. Wash with cold water and soap. 2. Add a few drops of ammonia to a cup of water Steep the stain in the solution.	Same as for milk and wool.

Stain	*Condition*	*White Cotton and Linen*	*Coloured Cotton and Linen*	*Silk and Wool*	*Synthetic Fabrics*
	Dry	Treat with alternate application of dilute potassium permanganate solution and oxalic acid.	Same as white cotton	Treat with a solution of potassium permanganate, acetic acid and hydrogen peroxide, as described under fruit stain.	
Ink (black and blue).	Fresh	1. Rub the stain with a cut tomato, wash ; rub salt, wash. Repeat the process till stain is removed. 2. Soak the stain immediately in sour milk or curd, for half an hour. Do not allow the curd or milk to dry. Wash with soap and water. 3. Apply salt and lime juice and leave it for half an hour. Wash.	Same as cotton.	Treat with sour milk or curd as for white cotton.	Same as silk and wool.
	Dry	Try above numbers 2 and 3 with prolonged treatment. Steep in dilute oxalic acid. Rinse thoroughly with dilute borax solution.	-do-	-do- Steep in dilute oxalic acid and rinse in dilute ammonia solution.	-do-
Ink (blue black). This stain is iron oxide and colouring.	Dry	Bleach with javelle water.	Bleach with hydrogen peroxide.	Same as coloured cotton.	Bleach with dilute sodium perborate.

Ink (red)	Fresh and non-fast.	1. Wash with soap and water. 2. Steep in borax solution.	Steep in borax solution.	Steep in dilute ammonia solution.	Same as silk.
	Dry and fast.	1. Same treatment as for dye stain. 2. Mix yolk and white of an egg, add two drops of dilute sulphuric acid to this. Apply this mixture and wash. Repeat the process till the stain is removed. 3. Wash with salt solution to remove egg stain. Steep in solution of salts of lemon (1 oz. to a pint).	Same treatment as for dye stain. Same as cotton.	Same treatment as for dye stain.	Same treatment as for dye stain.
Marking Ink (This stain is very difficult to remove.)		Steep alternately in dilute iodine solution and dilute sodium thiosulphate solution or potassium cyanide.	Same as cotton.	Same as cotton.	Same as cotton.
Ball point Ink.		Swab with methylated spirit using a pad of blotting paper below.	-do-	-do-	-do-
Iodine	Fresh	Apply starch paste on the stain. Leave it to absorb the stain. Wash.	Same as cotton.	Same as cotton.	Same as cotton.
	Dry	Steep in sodium thio-sulphate solution.	Steep in sodium thio-sulphate solution.	Steep in sodium thio-sulphate solution.	Steep in sodium thio-sulphate solution.
Iron rust		1. Steep in oxalic acid sol. and then rinse with	Same as for white cotton.	Same as for white cotton.	Same as for white cotton.

Stain	*Condition*	*White Cotton and Linen*	*Coloured Cotton and Linen*	*Silk and Wool*	*Synthetic Fabrics*
		dilute borax solution. 1. Steep in solution of salts of lemon.			
Lip stick		1. Steep in methylated spirit and wash with solvent soap. 2. Moisten and soften by working glycerine into the stain. Leave for a short while Rinse and then wash with surf or soap.	Same as for white cotton.	Same as for white cotton.	1. Steep in kerosene or turpentine, wash with soap and warm water.
Black lead or Transfer paper.		Steep in methylated spirit. Wash.	Steep in methylated spirit. Wash.	Steep in methylated spirit. Wash.	Steep in methylated spirit. Wash.
Medicine (May be a mixture of metallic substance, fruit and alcohol) therefore, suitable treatment for all the above must be tried.		1. Steep in warm water. 2. Steep in oxalic acid and wash with borax solution. 3. Steep in methyl alcohol or surgical spirit.	-do-	-do-	-do-
Milk or Cream		Sponge with benzine or carbon tetrachloride. Wash.			

Mildew (Difficult to remove).	1. Apply soap lather on the stain and cover it with french chalk and place in the sun to bleach. Repeat the process till the stain is almost removed. Then treat it with salt, and lime juice. Wash. 2. Bleach with javelle water.	Same as for white cotton if fast colour. Bleach with hydrogen peroxide.	Same as for coloured cotton. Same as coloured cotton.	Same as for coloured cotton. Bleach with sodium perborate.
Mud	Allow to dry and brush it off. Wash with soap and water. If persistent, treat with solution of potassium permanganate and oxalic acid.	Same as for white cotton.	Same as white cotton.	Same as white cotton.
Nail Varnish	Apply amyl acetate (this has smell like bananas) to the stained area with a cotton wool pad. This must not be used on any acetate rayon fabric.	Same.	Same.	Same, also see note under (1).
Oil, paint and varnish.	1. Steep in turpentine. Wash with solvent soap 2. Steep in alcohol. Wash with solvent soap. 3. Sponge with equal parts of alcohol benzine.	Steep in kerosene or turpentine. Wash with solvent soap.		For rayon, alcohol is not used.
Perspiration.	1. Steep in cold water. 2. Steep in dilute ammonia solution.	For fast colours use same treatment as for coloured cotton.	Same as for coloured cotton.	Same as for coloured cotton.

Stain	*Condition*	*White Cotton and Linen*	*Coloured Cotton and Linen*	*Silk and Wool*	*Synthetic Fabrics*
		3. Wet the stain and place it in the sun for bleaching. The fabric must be kept wet until the stain is removed. 4. Bleach with javelle water.	*For non-fast—* Steep in dilute ammonia. Then treat it with dilute hydrogen peroxide followed by a solution of sodium hyposulphite.	Same as for coloured cotton.	Same as for coloured cotton.
Perfume		1. Treat with ethyl alcohol. 2. Bleach with hydrogen peroxide.	Same as for white cotton.	Same as for white cotton.	Bleach with sodium perborate.
Rain water		1. Steam the stained portion. 2. Sponge with dilute acetic acid solution.	1. Steam the stained portion. 2. Sponge with dilute acetic acid solution.	1. Steam the stained portion. 2. Sponge with dilute acetic acid solution.	
Scorch		1. Bleaching in sunlight is the best. Apply soap lather to the stain, and place it in the sun. Keep the stain moist while it is in the sun. 2. Rub dry borax and wet muslin over the stain 3. Steep in dilute ammonia. Place the stain in the sun for bleaching.	Same as for white cotton. -do-		

Shoe polish		1. Scrape off the stain if dry. Apply a little grease. Wash with hot water and soap. 2. Steep in turpentine. Wash with solvent soap.	1. Steep in turpentine. Wash with solvent soap.	1. Steep in alcohol. Wash with solvent soap.	1. Steep in kerosene or turpentine and wash with solvent soap.
Soot		1. Brush and apply starch paste, wash with solvent soap. 2. Apply a paste of French chalk with water. Wash with solvent soap.	Same as for white cotton.	*For washable* — Use same treatment as for cotton. *For unwashable*— Cover the stain with a grease absorbent. Leave it for one hour. Brush off the powder.	Same as for silk and wool.
Urine stains on children's napkins.		Apply ethyl alcohol and allow to evaporate. Then apply chloroform and allow to evaporate.			
Water spot				Hold in steam until damp. Iron.	

Dye stains may be acidic or alkaline, and so, the nature of the stain is ascertained before a specific removing regent is used.

Mineral stains, such as iron mould, black ink, and certain medicine stains are compounds of a metal and a dye. These are first treated by acid reagents to act on the metal, and then by an alkaline solution to neutralise the acid reagent and act on the dye.

Neither perspiration nor scorch marks fall into any of the above groups. Perspiration has no protein component and cannot, therefore, fall under the group *Animal*. It cannot obviously fall under the *Vegetable* group, even though it is acidic.

Scorch is a brown stain caused by a very hot iron and is in a class by itself.

Grass stains come under vegetable groups but a different method is used for removing the green colouring matter (chlorophyll).

Stain removing must be carried out with care and in such a manner as to restore the garment to its original appearance and texture.

General Rule. 1. Remove the stains when fresh, as then they are easy to remove with simple methods.

2. Study the nature and the texture of the fabric specially when chemical reagents and bleaches are to be used, as these have injurious effects on wool, silk and synthetic fabrics. When chemical reagents are used and specially on animal fabrics, they must be in dilute solutions. Several applications of weak solutions are less harmful than a single application of a strong solution or an undiluted reagent. If bleaching has to be done, only hydrogen peroxide in dilute solution (1 teaspoon to 1 pint) is used for silk and wool, and for rayons nothing but sodium perborate. The fabrics must be rinsed in cold water several times after the above treatment.

3. Treat known stains with specific reagents.

4. Unknown stains should be treated with simple methods such as steeping in cold or hot water or washing with soap. Then use mild reagents and follow with strong ones. If the stain still persists, resort to bleaching only when all other treatments fail.

The fabric should be in contact with the reagent only until the stain is removed. The fabric then should be rinsed in water several times to remove the reagent, which, if allowed to dry in the fabric, may damage it.

5. All acid reagents should be neutralised with an alkaline rinse and *vice versa*.

6. If a stain is removed by the sponging method, sponge the stain with the solution, working in a circular movement starting from the outer edge of the stain to its centre (Fig. 85). This prevents the stain from spreading.

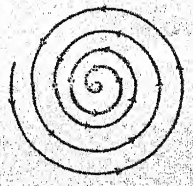


Fig. 85

14

Methods of Laundering and Their Principles

Laundering of clothes consists of two processes—the process of removing dirt from the clothes and the process of finishing them to regain the appearance of neatness as a new fabric.

Methods of Cleansing. The methods used for removing dirt and cleaning the clothes depend on the nature of the fabric and the kind of dirt. The dirt that soils the fabric consists of the dust particles, which are either on the surface of the fabric or are held in the fabric by grease. The loose dust particles may be removed by shaking, brushing or by the action of pedesis in steeping. Pedesis is the natural movement of particles in liquids. For removing the dirt, it is necessary to remove the grease first from the fabrics by means of emulsification or absorption ; and thus liberate the dust particles. The essential factor in the process of cleansing, therefore, is the use of a grease solvent or absorbent to remove the grease and an application of hard or delicate pressure to remove the dust. The application of pressure is done in four ways :—

1. Application of friction.
2. Application of light pressure.
3. Application of the principle of suction.
4. Washing Machines.

Application of Friction. This method should be applied to the washing of strong and durable fabrics, *e.g.*, household linen and cotton clothes.

Friction may be applied by means of hand-rubbing or by

1. APPLICATION OF FRICTION.
1) Hand friction or Rubbing.
2) Special Scrubbing by brush.
3) Rubbing & Scrubbing.

means of some appliance, such as a brush or a scrubbing board. The dhobi's method of washing consists in beating the clothes on a stone which also can be classified under this principle. But this method is not advisable as it causes uneven friction on clothes, stretches the clothes in parts and thus, the clothes wear out much quicker.

1. *Hand Friction or Rubbing.* This is suitable for washing small articles which are lightly soiled, *e.g.*, blouses, handkerchiefs etc.

Method. Requirements are hot water, a basin and a dry soap.

Wring out the article from the steeping water and place it in hot water. Squeeze it and then wring it out of the hot water. Apply soap all over the article holding the material between the hands, rub one part of the material on another. This causes a permanent lather to be formed in the rubbed portion, which cleanses the material. Rinse the article in hot water. Repeat the process if the article is still dirty.

2. *Special Scrubbing by Brush.* This method is suitable for strong fabrics and for articles which are very dirty such as jharans and apron, overalls, cuffs and neck-bands of coats.

Method. Requirements are hot water, wooden board, dry soap, a scrubbing brush and a basin.

Place the article in hot water, and squeeze it to saturate it in hot water and wring it out. Spread on a flat surface and apply soap. Scrub the material in one direction, away from the worker, causing a premanent lather in the fabric. Sprinkle some water on the surface while scrubbing. Rinse the article in hot water, to remove the dirty soap.

3. *Rubbing and Scrubbing.* This consists of both rubbing and scrubbing. This method is suitable for any articles of strong fabric that are soiled.

Method. Requirements are scrubbing board, tub, a dry soap and hot water.

Place the scrubbing board in a tub or sink, half filled with hot water. Wring the article out of the steeping water. Place it in hot water. Squeeze out a portion of the article and place it flat on the board ; apply soap on it, rub the part on the board to cause a permanent lather in the fabric. Continue this till the whole article is soaped and rubbed well. Rinse out the article in hot water to remove the dirt.

If the article is very soiled, use a brush to scrub the dirty spots.

Application of Light Pressure. This method should be applied to the washing of fine texture.

Kneading and Squeezing. This method is suitable for coloured artices and delicate fabrics, *e.g.*, coloured cotton, silk, woollen and lace. The process consists of kneading and squeezing of the articles by hand in the soap solution ; since the application of pressure is very light, it does not damage the texture, colour or weave of the fabric. This method does not require any special apparatus and so it is very easy to manipulate.

Method. Requirements are a basin or bowl, warm water, soap flakes or rita nut solution.

Make a soap solution with hot water, add sufficient cold water to the solution to get the correct temperature suitable for the fabric. Shake the solution thoroughly to get a lather. Place the article in the solution, squeeze it well to saturate it with the soap ; knead and squeeze part of the article at a time. Continue this process till the whole article is cleansed. At the end of the process, there should be some lather left over. Disappearance of lather indicates that the article is still dirty and needs more soap, and use of several soap waters is, therefore, required to cleanse the article. The very dirty portions of the article, such as the neck-bands and the sleeve-bands should be lightly rubbed with the hand or a soft brush using extra lather.

The first rinse should be in warm water to remove the dirty soapy water. Repeat rinsing in two or three cold or hot waters as is suitable for the fabric.

Application of Suction or Suction Washing. This method is suitable for cleansing small and large articles of any fabric or colour. It is generally used to cleanse heavy articles, such as trousers, coats, blankets, which are not possible to clean by kneading and squeezing, and which will not stand friction. It is a most practical method, which saves time and labour. The apparatus required is a suction washer described on page 124 plus a tub. For this also the soap must be in solution.

Method. Prepare soap solution using a suitable soap. Adjust the temperature by adding cold water to it as prescribed for the fabric. Place the article in the soap solution and press it with the suction washer so that it is saturated with the solution.

Then work the suction washer up and down in the solution lightly pressing the article. Continue this process till the article is cleaned thoroughly.

Use a fresh soap solution if the article is very soiled. Rinse the article to remove the soiled soapy water, using warm water. Then rinse in cold or warm water as is suitable for the fabric.

Washing Machines. In western countries, washing machines large and small are available. These are operated by hand or by means of electricity. All these work on the same principle of agitating the clothes in soapy water, thus bringing about the cleansing action. A washing machine, therefore, consists of two portions. A container and a perforated cylinder in the container, which, by revolving, agitates the clothes in the soapy solution. The rotation is brought about by hand-power or by means of electricity.

There are a number of washing machines available in the Indian market to-day, but all of these are worked by electricity. So, only in big cities, where electricity is available, the housewife should purchase a machine for her home laundry.

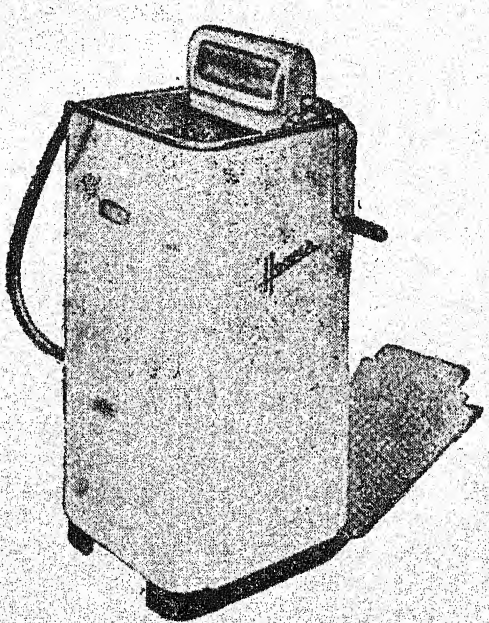


Fig. 86. Washing Machine.

Two important factors should be taken into consideration before the housewife buys an electric machine. Firstly, if it would be really economical for her to get it considering the amount of work to be got out of it. Secondly, she must acquire full and complete practical knowledge of the washing machine and keeping it in working condition. For the latter, she will have to study the literature about the mechanism and working of any particular machine or of several machines before making the purchase. She should also stipulate that the dealer gives her adequate training in the use and the upkeep of the machine.

METHODS OF FINISHING

Clothes, after the process of cleansing, get creased, and need to be straightened to look like new.

Finishing is the process used to straighten the clothes, so that the appearance is attractive and neat. The methods used for finishing in laundry are ironing, pressing, steaming, mangling and calendering. It is essential that the fabrics contain sufficient amount of moisture, so that it is pliable enough to be pulled into shape during the process of finishing. Fabrics like cotton and linen are damped before finishing. In cases like silk and wool, where the sprinkled water does not spread evenly, these should be left half dry for finishing.

Damping is done to soften the texture of the fabric.

Rules.

1. Use warm water as it spreads more quickly.
2. First damp all the hems, folds and pleats by running wet fingers over them.
3. Spread the garment on a clean table, dip the hand in water and sprinkle it lightly over the article.
4. Roll up the article and wrap it in a towel and leave it for 15 to 20 minutes.

Ironing. This process consists of running a hot iron backward and forward along the selvedge threads of the cloth with pressure. The heat of the iron and the pressure applied is controlled according to the texture and the nature of the fabric. For example, silks are not ironed with a very hot iron and a fine muslin cloth does not need much pressure to smoothen its surface.

Cottons and linens are all ironed with a hot iron. All silks

and art silk except velvet and crepe are ironed with a warm iron. Woollens as a rule do not need much finish and are not ironed.

Method of Ironing. 1. Essentials for good ironing are a hard padded surface and a clean hot iron.

2. For straight articles such as saris, sheets and table-cloths use a table $4 \times 2\frac{1}{2}$ feet and about 3 ft. high. For other articles use an ironing board. Have a bowl of water, a piece of muslin, and an iron stand.

3. Cover the table with a blanket and then with a clean sheet. Remove all the creases to get a smooth, even surface.

4. Open out the damped article, stretch it to its original shape and iron the double parts of hems on the wrong side of the article by running the hot iron backward and forward on the selvedge threads.

5. Turn the article on the right side and iron out the rest of the parts.

Pressing. This process consists of placing a hot iron on the creased portion of the material and then lifting it up. The operation is continued till the crease disappears. It differs from ironing in that it is not a continuous running of the iron to and fro on the surface of the cloth.

Pressing is used for finishing woollens and fabrics with a special texture, such as georgettes, crepes.

Methods of Pressing.

1. Prepare the ironing table as described under 'Ironing'.
2. Spread the garment over the prepared surface.

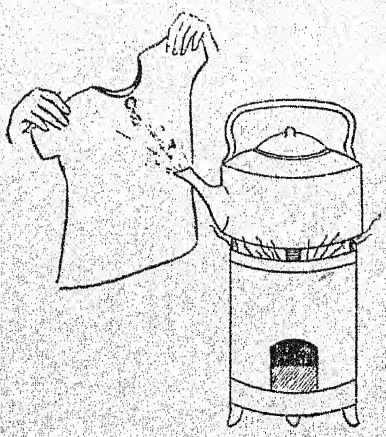


Fig. 87. Steaming of Velvet Blouse

3. Spread a damp piece of muslin over the creased portions. Place a hot iron on this portion, press and lift the iron.

4. Continue this process until all the creases are removed.

Steaming. This process consists of allowing the steam to pass through the surface of the cloth. Fabrics with a pile surface, such as velvet and velveteen are finished by this process. The passing of the steam through the pile of the fabric on the wrong side helps to raise and freshen the pile.

Methods and Processes :

1. Damp the article and hold it in front of a very hot iron or place it before the spout of a kettle of boiling water (Fig. 87).

The heat of the iron converts moisture in the cloth into steam, which escapes through the fabric with sufficient pressure to straighten the surface of the cloth. The steam from the kettle brings about a similar result.

Mangling. Mangling is used only in cases of rough articles, such as jharans, tweeds, etc., where the surface is expected to be neat but not very smooth. The article immediately after washing and before drying is passed through a mangle several times and then put to dry. This process helps to straighten the threads.

Calendering. Calendering is used in commercial laundries to finish straight pieces of cotton and linen articles, such as table cloths, curtains and bed sheets. Drying and finishing is done in the same process. The straight pieces of articles are passed through two heated metal rollers which continually rotate. The process dries up the moisture and the pressure, caused by the rotation, irons out the material.

Irons get stained after use. These stains if not removed will be transferred on other garments which would be risky. Therefore, it is essential to clean the iron before as well as after its use.

Methods of Cleaning an Iron.

1. Make a bag of bees wax in a piece of muslin and rub this bag on the surface of the hot iron. Rub the iron backward and forward on a thick piece of cloth to clean it.

2. Rub the hot iron on finely powdered bath brick, and then rub the iron with a thick cloth. Bath brick, being a light abrasive, removes the stains without impairing the smoothness of the surface. Emery paper should never be used for cleaning an iron.

3. Rub a candle on the surface of the hot iron and then rub the iron on a thick cloth.

Note. It is essential to take good care of irons, so that the smooth polished surface of the iron is preserved. Special attention must be paid to prevent the rusting of the iron. Irons after use should be left to cool, by standing them on their heels, then rubbed with a soft cloth before storing.

15

Laundering Cellulose Fabrics

Cotton and linen are easy to clean and are, therefore, popular for clothing. Cotton is the main fabric in India and is cheap. It is used much more than linen which is more expensive. Cotton is similar in many respects to linen, but linen gives a better finish in laundry. Both are obtainable in many varieties and with different finished surfaces and colours. The processes used for laundering of these fabrics are governed by :—

(1) The texture of the fabric, (2) the fastness of its colour, (3) the finish appropriate to it.

In washing cotton and linen care must be taken :—

(1) to avoid the use of such methods and cleansing reagents as are likely to weaken the fibres,

(2) to preserve the whiteness of the white, and the colour of the coloured articles,

(3) to clean, stiffen, finish and to freshen the appearance of the fabric, and make it look as new as possible.

WASHING OF BLEACHED COTTON AND LINEN

Examination of Articles. Examine the article for tears, holes and stains and mark them with a light pencil. Mend all the tears, and holes before wetting the garments. Also remove such stains as are not likely to disappear in the process of washing. (For instructions for stain removal see Chapter 13).

Sorting. Sort the articles in the following groups. Each group is required to be steeped in separate containers of water:—

(1) Coarse articles, such as jharans, aprons used in the kitchen.

(2) Coarse articles for cleaning and dusting.
(3) Bed linen and other personal clothes.
(4) Table linen.
(5) Handkerchiefs.

Steeping. This process is very important in the washing of cottons and linens as it economises time, labour and soap. Loose and soluble dirt is removed by the pedesis of the water particles. The material gets thoroughly soaked, which helps in the removal of fixed dirt. Stains soluble in water are removed and the starch of the previous laundering is softened. Since cotton and linen are not weakened by water, all articles made of these fibres should be steeped. The length of time allowed for steeping depends on the percentage of dirt in the garment. It may be shortened if warm water is used as it quickly dissolves the dirt. Hot water should not be used as this hardens the protein matter and fixes the dirt.

Rules for Steeping :—

(1) Use a clean tub that has no rust marks.

(2) The tub, bucket or basin should be sufficiently large to hold a sufficient quantity of water and the clothes.

(3) Steep household articles, such as kitchen jharans, aprons, table and bed-linen overnight and the personal garments for an hour at least. Kitchen jharans should be steeped in water to which washing soda should be added (one teaspoon to a gallon of water).

(4) Add salt and a little disinfectant to the water in which handkerchiefs are soaked. Salt helps to dissolve the mucous, thus making the washing easier.

Washing. The method employed in washing is determined by the texture of the fabric, the type of article, its colour, and the type of dirt present in it. For this reason also it is necessary to sort out articles in different groups. The table on page 166 gives the method used for washing each group.

It may also be mentioned here that while the table on the next page only gives the type of soap to be used any one of the modern detergents like surf, det etc. can be used with good results. The method used in washing with these chemicals is always given on the boxes in which they are sold.

TABLE

Articles	*Cleansing Agents*	*Water*	*Method of Washing*
1. Coarse materials, such as jharans, aprons, bath mats etc.	Hard bar soap or paraffin wash for very dirty articles.	Warm.	Application of hard friction or scrubbing with a scrubbing brush (for very dirty articles).
2. Strong white articles, such as table linen, bed linen, personal clothes, such as latha salwars, petticoats, white shirts, white trousers.	Sunlight soap or any soap cake. Surf, Rin	Warm.	Application of light friction for washing the article on a scrubbing board.
3. All coloured articles and fine materials, such as organdie, muslin, etc.	Soap jelly or soap solution or soap flakes.	Lukewarm.	Application of light pressure, *i.e.*, kneading and squeezing.
4. Heavy articles, such as cretons, curtains, durries, etc.	Bran wash or soap jelly.	Warm.	Suction washing.

Note : When washing personal garments, the neck band, the cuffs, and the arm holes need special attention. These should be given an extra rub. Rinse in clean warm water to remove thoroughly all soiled soap, water from the clothes before putting the clothes in the boiler. More than one rinsing may be necessary.

Boiling. All white cottons and linens are boiled. Table linen with coloured patterns and designs which are fast in colour can also be boiled.

Boiling disinfects, whitens and freshens the clothes.

Preparation and method of boiling. Water used for boiling must be soft and soapy. Use soda and shredded soap in the proportion of one teaspoon of soda and one tablespoon of soap to a gallon of water to soften water. The proportion may be altered according to the hardness of water. Soda alone should not be used as it may damage the fabrics. Soda must be first dissolved in a little water.

Half fill the boiler, add soda first, dissolve and then soap. Heat and agitate the water to form a lather. Open out the clothes and drop into the boiler, bring to boil, and boil for 15 minutes. Overboiling causes white clothes to become yellow. Very dirty or discoloured articles are kept below boiling point for one or two hours to bleach the fabrics.

Use a boiling bag for all clothes so that these do not come in contact with the scum. Scum may cause discolouration and it adheres to the clothes and is difficult to remove.

Boil separately the kitchen jharans and aprons, which are full of stains and grease for half an hour with a little more washing soda added to the water.

Remove clothes from the boiler with a wooden rod or a pair of tongs.

Rinsing. After boiling, rinse the clothes in several warm waters to remove all traces of soap from the fabric. Give a last rinse in cold water to restore the whiteness. Wring out the moisture.

Stiffening and Blueing. It is done as one process. Shake a bag of blue in the prepared starch to get the desired shade. All white clothes are blued. To economise water to get good result and to save wastage of starch and blue, starch and blueing are done as combined processes. All cottons and linens except bed-linen and underwear are starched. Articles, such as table mats, tray clothes, table napkins, etc. are heavily starched while personal clothes are given a light stiffening. Nurses' caps, men's dress shirts, and collars need an extra stiffness and so they are stiffened with cold water starch.

Note. For reasons for starching and blueing, and table to show strength of starch see Chapter 12.

Rules for Starching and Blueing :—

(1) Stir the starch and blue water together well before putting in the articles, because the blue particles settle at the bottom and may cause patches on the articles.

(2) Squeeze the article well to get a thorough penetration of the starch.

(3) Articles with borders, or with fringed lace and crochet edges, need special attention, as such edges spoil their appearance if starched. Therefore, while starching such garments, gather the edges in the hand and dip the rest of the article in the starch water carefully. The edges may be then treated with a dilute solution of starch.

Removal of Moisture. Use of a mangle is very effective for removing all the moisture. The article is folded and then passed through a mangle. For delicate article, rubber wringers are used as they neither spoil the texture of the fabrics nor stretch nor tear the cloth.

Drying. Outdoor drying is best for all white articles as sunlight helps to bleach the cloth, quickens the drying, disinfects and freshens the clothes. Cottons and linens do not hold much moisture and, so, are easily hung out to dry without causing any harm to the cloth. Articles should hang out on a line by the selvedge thread and then clipped to the line with wooden clips. They should not be left out in the sun too long but removed as soon as they are dry. Hot sun causes white clothes to become yellow.

Important variations of the foregoing processes when applied to :—

(*a*) Unbleached cotton and linen fabrics.
(*b*) Coloured cotton and linen fabrics.
(*c*) Cretonne and chintz.
(*d*) Organdie.
(*e*) Velveteen.
(*f*) Flannellette.

(*a*) **Unbleached Cotton and Linen Fabrics.** Their characteristic colour, shade and texture must be preserved. Therefore,

(1) None but very soiled articles are to be steeped.
(2) Use stain removal agents in solutions only.
(3) Bleaches are sparingly used and with care.

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(2) Use stain removal agents in solutions only.
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(4) Water used for washing has to be at a lower temperature.
(5) Slightly thinner starch (with no blueing) is used.

(*b*) **Coloured Cotton and Linen Fabrics.** For colours are generally used in these fabrics, yet it is not safe to take it for granted. Precaution must be taken to test their permanence. An easy test is to wet a corner of the material and to place it in-between dry pieces of white cloth and then press it hard with a hot iron. If the colour is unstable, it will come off on the white cloth.

Fast coloured articles gradually fade and get dulled by age and repeated washings. Therefore, care must be taken to preserve the fastness of the colour after washing, by not using such reagents and processes which have a harmful effect on colour.

Factors which affect colour are (*i*) long contact with moisture, (*ii*) excessive heat, (*iii*) acids and alkalies, and (*iv*) friction. Articles of loose colour are difficult to wash and are better dry cleaned, as there is no harmful effect of dry cleaning reagents on colours. But dry cleaning is expensive, and so, washing is practically unavoidable. The processes of washing such garments must be carried out in quick succession. Some mordant, such as common salt or vinegar, is used in washing and rinsing waters to fix the colour and thus minimise its bleeding.

Rules for Washing Coloured Articles. Stains are to be removed with water and soap as fast as possible. Solutions of chemical reagents are to be carefully used and only when absolutely necessary. Rinsing is to be done quickly and thoroughly in water. Coloured articles must not be steeped, but very dirty articles may be steeped for a short time with a mordant added to the water.

Wash all the articles by either suction washing or by kneading and squeezing. Use warm water (100°—110°F) and soap jelly or solution, which is free of alkali. Add a mordant to the washing water, if necessary.

Rinse in 2 or 3 warm waters till all the soap is removed. Last rinse must be of cold water to which acetic acid or vinegar is added to fix and freshen the colour. (One teaspoon of acetic acid or 2 table spoons of vinegar to a gallon of water.) The acid or vinegar need not be used for articles, of which the colour is guaranteed to be fast.

Coloured articles are neither boiled nor blued except blue

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(1) Stir the starch and blue water together well before putting in the articles, because the blue particles settle at the bottom and may cause patches on the articles.

(2) Squeeze the article well to get a thorough penetration of the starch.

(3) Articles with borders, or with fringed lace and crochet edges, need special attention, as such edges spoil their appearance if starched. Therefore, while starching such garments, gather the edges in the hand and dip the rest of the article in the starch water carefully. The edges may be then treated with a dilute solution of starch.

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Drying. Outdoor drying is best for all white articles as sunlight helps to bleach the cloth, quickens the drying, disinfects and freshens the clothes. Cottons and linens do not hold much moisture and, so, are easily hung out to dry without causing any harm to the cloth. Articles should hang out on a line by the selvedge thread and then clipped to the line with wooden clips. They should not be left out in the sun too long but removed as soon as they are dry. Hot sun causes white clothes to become yellow.

Important variations of the foregoing processes when applied to :—

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(4) Water used for washing has to be at a lower temperature.
(5) Slightly thinner starch (with no blueing) is used.

(*b*) **Coloured Cotton and Linen Fabrics.** Fast colours are generally used in these fabrics, yet it is not safe to take it for granted. Precaution must be taken to test their permanence. An easy test is to wet a corner of the material and to place it in-between dry pieces of white cloth and then press it hard with a hot iron. If the colour is unstable, it will come off on the white cloth.

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Rinse in 2 or 3 warm waters till all the soap is removed. Last rinse must be of cold water to which acetic acid or vinegar is added to fix and freshen the colour. (One teaspoon of acetic acid or 2 table spoons of vinegar to a gallon of water.) The acid or vinegar need not be used for articles, of which the colour is guaranteed to be fast.

Coloured articles are neither boiled nor blued except blue

articles, which are blued in deep blue water to restore any lost colour. Use boiling or cold water starch as may be needed by the article.

Remove moisture thoroughly before hanging the article to dry, to avoid getting dark patches on the lower side of the article. Dry the articles in the shade to prevent bleaching caused by sunlight.

Finish the articles using a moderately hot iron.

(*c*) **Cretonne and Chintz.** These are heavy materials used for household furnishing. Chintz has a thinner texture than cretonne, and is stiff and has a glazed surface. These are available in all colours and patterns. The principles which apply to the cleansing of coloured cottons apply to these materials also. But extra-special care must be taken to test the fastness of the colours. Cleansing with bran water (see Chapter 12) is more suitable than soap. Bran helps to fix the colour and gives some stiffness to the material. A suction washer with a long handle is convenient for washing these. A wooden beater as shown in Fig. 88 may be used in place of a suction washer. A washing machine is a great help for these heavy articles. Boiling water starch is used for stiffening, the strength depending on the texture of the fabric. The usual proportion is 1—10. Let the starch dry well in the fabrics. Damp evenly, roll it up for half to three quarters of an hour before ironing.

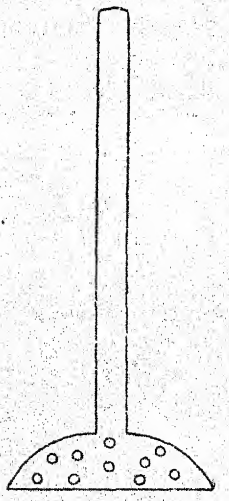


Fig. 88.
A wooden beater.

(*d*) **Organdie.** This is an expensive material. It is woven from good quality yarn of many twists, and is given a special finish to produce transparent stiff fabric. It is either white, coloured or printed. Organdie is washed like coloured cottons. New organdie materials do not require stiffening. To restore the natural stiffness of the material, it is ironed immediately after washing while it is wet. After several washes, old organdie materials lose their natural stiffness, when dilute boiling water starch, diluted to 1 to 12 strength, is used. Gum water is used for very expensive organdies.

(*e*) **Velveteens.** Velveteen is a pile cotton fabric, which looks

like velet. This also is an expensive fabric and is available in many colours.

Velveteen with fast colours are usually washed. Dry cleaning is advisable if the colours are doubtful.

The processes used in cleansing these material are similar to those used for coloured cottons, but precautions must be taken to restore the pile effect, and the softness of the fabric.

Special rules to be followed are :—

(1) Wash by squeezing, not by kneading the material.

(2) Suction washing is better. Add acetic acid (one teaspoon to a gallon of cold water) to the final rinse.

(3) Hang up the garment after the final rinse and allow the moisture to drip or lightly press the article in between a dry towel.

(4) Hang up to dry in a warm place and in a through draught.

It is better to hang it up in front of a heater with the wrong side facing the heater. The steam generated by the heat will thus pass through the wrong side to the right and help in raising the pile and restoring the fluffiness of the material. In this way the drying and finishing go on side by side.

(5) If a heater is not available, steam-press the material after drying.

(*f*) **Flannelette.** It is a fabric woven entirely out of cotton, but in such a way that with its soft, fluffy surface it closely resembles wool flannel.

It is laundered in the same way as coloured cottons. As it holds much moisture it has to be wrung thoroughly dry and is finished when nearly dry with only a moderately hot iron.

Fire-Proofing of Flannelette. Flannelette is very inflammable because of its texture. It is advisable to treat the fabric with such reagents which will make it non-combustible.

The most satisfactory and effective method consists of making a tepid solution of 2 oz. boric acid and 4 oz. of borax in a quart of water. The material is immersed after the last rinse in the solution from quarter to one hour, according to the time it takes to penetrate a particular fabric. The material is then squeezed out well, dried and finished in the usual way.

The mixture forms an almost invisible layer on the surface of the fabric which, on application of heat, melts and forms a

glassy covering which does not burn.

It must be remembered, however, that washing will remove eht fire-proofing substance, so the fire-proofing treatment will have to be repeated each time the clothes are washed.

It is very wise to give the above treatment to all children's clothes every time these are washed, as the treatment is neither expensive nor laborious.

FINISHING OF COTTON LINENS

General principles and equipment required are described in Chapter 14.

Cottons and linens are generally starched and, therefore, need a good finish. Most of these are finished by ironing except velveteen, which is steam-pressed. In order to get a good and even finish, the starched articles must be well-dried, as ironing gives a very poor finish if the starch in the fabric is not completely dry.

PREPARATION FOR IRONING

1. Damp the articles (for rules and method see Chapter 14).
2. Roll each of them separately and keep aside for at least half an hour before ironing.
3. Prepare a table or an ironing board (see Chapter 14).
4. Place a small bowl of cold water, and a piece of muslin on the left-hand corner of the table or on a high stool.
5. Place a stand for the iron on the right-hand corner and keep handy the iron-holder, sewn out of some old material.
6. Select irons of a suitable size and shape for the work. Large and heavy irons are used for articles like curtains, sheets, table-cloths, bed-linen etc., and small irons for gathers, and delicate articles, such as muslin and organdies.
7. Heat the iron. The correct temperature of the iron is very important. The iron must be hot enough to remove creases and give smoothness but not so hot as to scorch the fabrics. For ironing cottons and linens, the iron must be really hot. If the iron is cold, starch from the fabric will stick to it and cause difficulty in ironing. It will also leave brown marks. Therefore, test the heat of the iron before beginning to use it.

Tests for Heat. 1. Hold the iron over the back of the hand and learn to judge the heat.

2. Flick a drop of water on the face of the iron and note the reaction. (*i*) A dull sound and a definite mark on the iron

indicates a cold iron. (*ii*) A moderately sharp sound and a slight mark indicates a moderately hot iron. (*iii*) A sharp hiss and no mark indicates a hot iron.

GENERAL RULES FOR IRONING

1. The surface to be ironed (or its cover) must be clean, smooth and free from patches or stains.

2. The iron must be cleaned and its surface well polished. An electric iron has a chromium or nickel surface, which is highly polished and easy to clean.

3. The articles (previously damped) should be opened out, shaped carefully and placed on the table. Use the left hand to smooth the cloth and to hold the article where necessary while ironing.

4. For flat articles and pleats, heavy and even pressure is

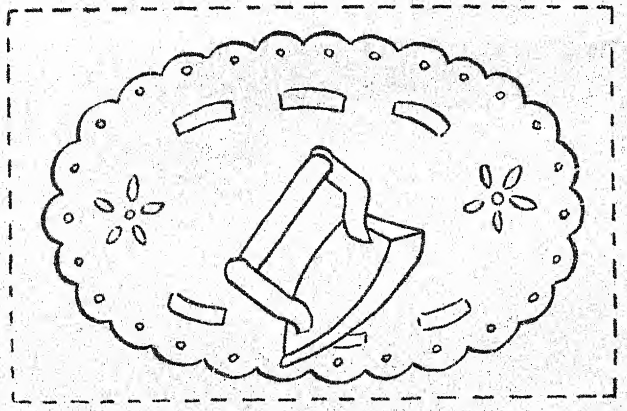


Fig. 89. Ironing of a Scallops.

used ; but for gathers, lace borders and scallops the pressure should be concentrated on the toe of the iron (see Fig. 89).

5. Ironing is always done along the selvedge threads of the garments from hem to neck.

6. Materials requiring a glossy surface should be ironed on the right side. The embroidered materials and laces are ironed on the wrong side over a flannel pad.

7. All double or thick parts and seams are ironed first on the wrong side. Stitching and hems are pressed heavily till the material is dry to avoid rough drying afterwards. Then small parts and trimmings are ironed. Next the sleeves and cuffs are

ironed on a single material or on a sleeve board. Then the collars are ironed.

8. Ironing is begun at the end of farthest part of the garment so that the ironed parts can be slid away from the worker, thus bringing the portion to be ironed under the worker's hand.

9. Materials must be ironed to complete dryness and give a finish.

IRONING AND FOLDING OF VARIOUS ARTICLES

SARIS

1. Cotton saris are starched and so, must be damped.

2. Open only about ½ a yard length at a time for ironing and begin with the border and then iron the remaining portion, working the iron along the selvedge thread.

3. Roll the ironed length lightly and shift aside. Open out the next half-a-yard and iron in the same way. Continue till the entire sari has been ironed.

4. Fold the length into two and keep on folding and refolding eight times till it measures about a foot in width.

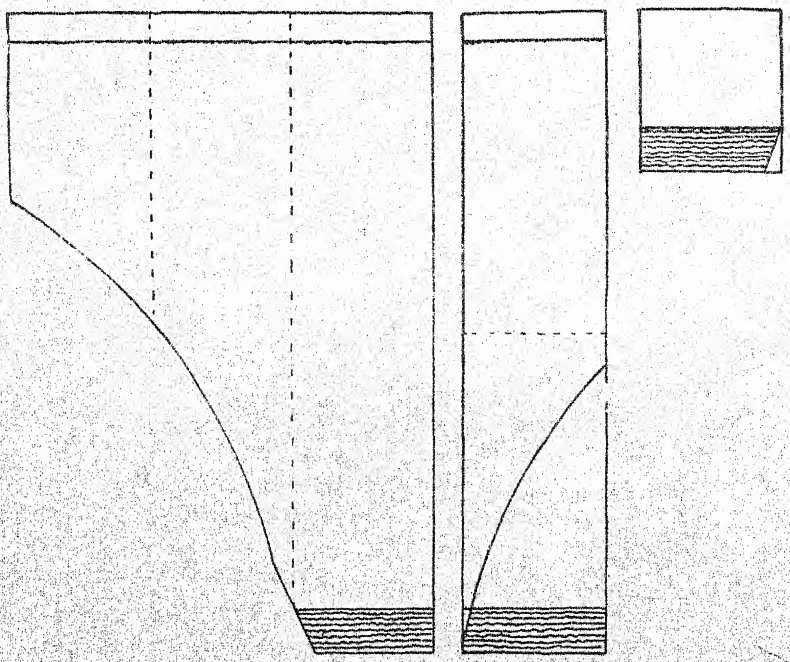


Fig. 90. Folding of a Salwar.

5. Fold the width of the sari lightly in four folds but do not press along the folds.

Note. Sari should not have any crease on its surface, and therefore, it must always be ironed on single material.

SALWAR

1. Cotton salwars are heavily starched and, therefore, thorough damping is necessary.

2. Open out one leg from the fork line and lay it flat on the table.

3. Iron the hem of the leg (*paicha*) and the waist band (*naifa*) first on the wrong side, and then on the right side.

4. Iron the rest of the leg working along the length of the garment.

Fig. 91. Use of a sleeve board.

5. Repeat the process on the other leg.

6. Fold the *salwar* into two along the fork line centre.

7. Fold the *salwar* from the *paicha* in a straight line up to the '*naifa*' and press down the fold.

8. Turn back the '*miani*' over the fold, thus making a three screen fold at the *naifa* (see Fig. 90).

9. Fold the length into two and refold it.

BLOUSE

1. Open out the damped blouse.

2. Iron hems and double parts on the wrong side.

3. Slip the sleeve on a sleeve board. Iron the shoulder and work downwards till the whole sleeve is ironed (see Fig. 91).

Note. If a sleeve board is not available, a device for ironing the shoulders can be improvised by padding up a round or oblong stone or a piece of wood.

4. Iron out the right half of the blouse, then the back of the blouse and lastly the left half, taking care to press along the selvedge threads.

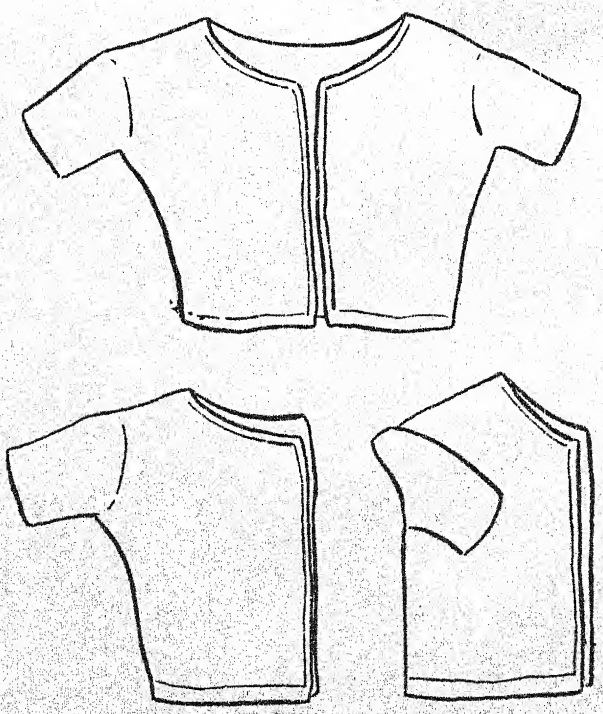


Fig. 92. Fold of a blouse.

5. Leave it to air on a hanger for a short time.

6. For folding, fasten the blouse and place it on the table facing downwards. From the centre of the shoulder, turn the sides towards the centre back. Turn back the sleeves, as shown in Fig. 92, to get a tidy strip. Fold the length into two.

7. An alternative method of folding is to fasten the blouse and holding the centre back and front with both hands to fold it into two. Turn the sleeves from the shoulder point towards the centre. This prevents the sleeves from getting crushed.

Note. Blouses should not be kept away in cupboards folded but on hangers. Folding is unavoidable for packing in trunks or boxes.

SARI PETTICOAT

1. On a skirt board, if available, open out the damped petticoat. Iron the hem, double parts and seams and waist bands on the wrong side. Slip the petticoat on a skirt board, keeping the waist band on the left side, iron along the length. Keep on turning each ironed portion till the whole petticoat is ironed.

2. On a table, if a skirt board is not available, open out the damped petticoat, iron the hem, double parts, seams and waist bands on the wrong side. Stretch it flat on the table along one of the seams, keeping waist band on the left. Straighten out one panel and iron it, working from hem to waist. Repeat on all the remaining panels. Fold the width into two and then again into two. Fold the length likewise.

SHIRT (including *Kameez*)

1. Open out the damped shirt.
2. Turn the shirt wrong side out. Iron the yoke, seams and other double parts, in that order.
3. Turn the shirt back to the right side out and iron again the above mentioned parts in the same order.
4. Iron the collar, first on the wrong and then on the right side.
5. Iron cuffs and sleeves.
6. Slip the shirt on a skirt board and iron the back first.
7. Turn the front uppermost and iron working from the shoulder downwards.
8. Press down the centre pleat. Apply heavy pressure.
9. For folding, button the front, lay the shirt back uppermost and fold the sides towards the centre from the centre of the shoulder. Turn the sleeves back as shown in Fig. 93 (*a*). If the cuffs are double, they are turned up and pressed before the shirt is finally folded as in Fig. 93 (*b*).

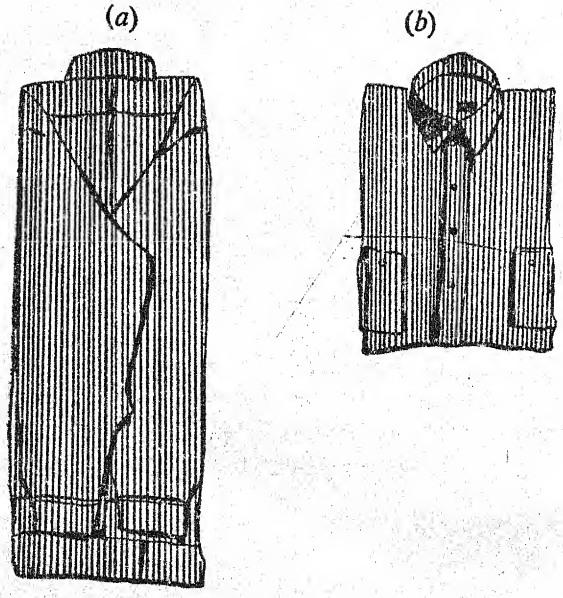


Fig. 93. Folding of a shirt.

TROUSERS AND KNICKERS

1. Open out the damped garment, turn it inside out and iron the seams and all the double parts including the trouser ends on the wrong side and then turn it right side out and iron it on the right side the same way again.

2. Fold one leg along the centre crease and iron on the inner side and then on the centre.

3. Iron the other leg in a similar manner.

4. Fold the trousers into two by placing the inner sides together. Bring back the extra fullness at the fork line towards the centre to form a narrow even strip. Then press the strip. Turn up the trouser ends and press them double.

5. Fold the length once, or, if preferred, twice.

FROCKS

1. A skirt board and a sleeve board facilitates the ironing of a dress or a frock.

2. Open out the damped dress and iron hems, seams and all double parts.

3. Iron sleeves as for blouses.

4. Iron the top portion, slip it after ironing over the end of

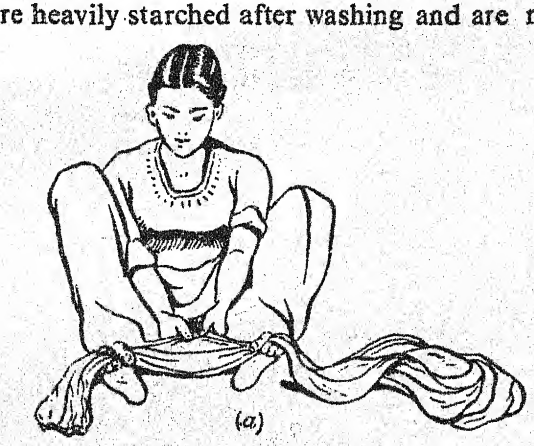
the board or table, spread out the rest of the skirt on the board and iron.

5. Pleats and gathers have to be ironed and pressed differently. In pleats, ironing is done on single material with the point of the iron along the seam under the lip or the fold of each pleat. Then the pleats are arranged, damped and pressed. If the material is gathered then the gathers are not pressed or ironed. The gathered material is spread out as much as possible and then ironed (on single material). The point of the iron is used in ironing the material closest to the seam which gathers it. When the garment is hung up for airing the folds of the gathers will form again.

6. Folding spoils the finish of the frocks and dresses and so they must be put on hangers before being put away.

MUSLIN DUPATTAS OR CHUNNIES

These are heavily starched after washing and are not ironed



(*a*)

(*b*)

Fig. 94. Gathering and twisting of a dupatta.

but finished by gathering up the width of the dupattas in fine gathers as shown in Fig. 94 (*a*) and by folding the length into 3 parts and twisting it up as shown in Fig. 94 (*b*).

TABLE CLOTH

1. Damp and smartly shake the cloth. Fold it in the four screenfold, Fig. 95. Roll it and keep it aside for half an hour.

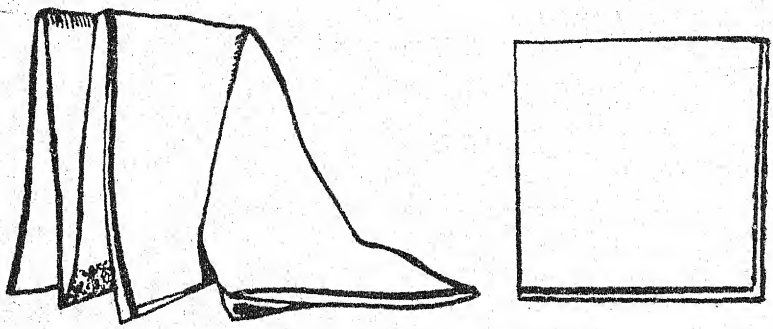


Fig. 95. Four screen fold of a table cloth.

2. Open out the roll and place the folded cloth flat on the table. Stretch and smooth it out. Iron the centre fold. Open out half the cloth from the centre fold and place it flat on the table with the right side uppermost. Iron it, working along the warp threads.

3. Slide ironed part over the edge of the table and spread out the second half and iron it.

4. Refold in a four screen fold. Press in the folds.

5. Fold into four screen fold across the length. Press in the folds.

TEA CLOTH

A plain tea cloth is damped, ironed and finally folded in the same way as a table cloth.

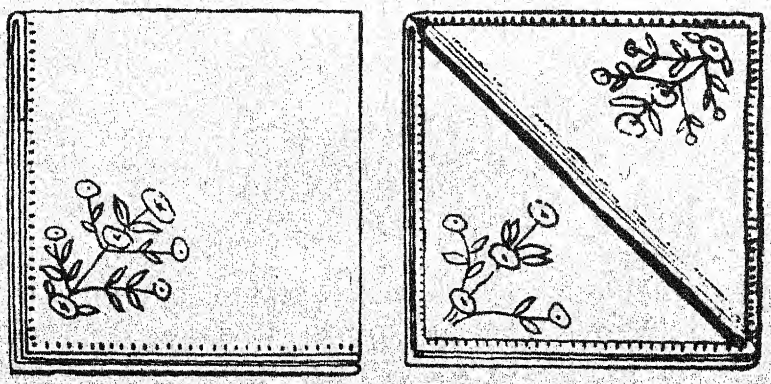


Fig. 96. Folding of an embroidered cloth.

An embroidered tea-cloth is ironed on the wrong side placing the article flat on the table. The embroidered parts are pressed down heavily on a thick flannel padding. It is folded on the wrong side into two folds, the first fold being along the selvedge threads and second along the warp threads. Turn over one corner to the centre point, thus displaying the embroidery (Fig. 96).

TABLE NAPKIN

1. Damp, straighten and fold into three screen folds as shown in Fig. 97. Roll and keep it aside for half an hour.

2. Open out the roll and place the fold flat on the table. Iron it. Open out $\frac{1}{3}$ of the fold and iron the $\frac{2}{3}$ of the napkin. Turn back the third fold, thus forming the three-screen-fold.

3. Iron. Press heavily over the folds.

4. Fold the length into three screen fold and press in the folds.

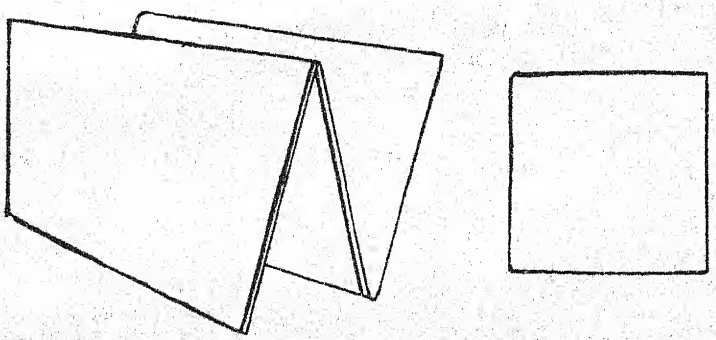


Fig. 97. Three screen fold of a table napkin

TEA NAPKIN

These are usually embroidered and are ironed in the same way as embroidered tea cloth.

TRAY CLOTHS

These are heavily starched and, therefore, a very hot iron is

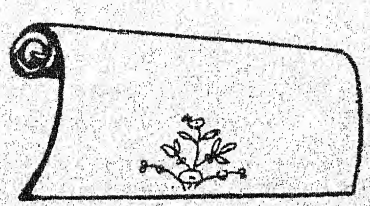


Fig. 98. Tray cloth.

required. These are ironed flat, rolled and not folded (see Fig. 98).

TEA COSY

If embroidered, is ironed on the wrong side. These are not folded.

ROUND TABLE MATE

1. Open out flat on the table.
2. Iron the centre along the warp and weft threads, working out towards the edges, keeping the threads of the material straight.

TOWELS

1. Open out flat and press lightly.
2. Fold in half lengthwise. Fig. 99 (*a*)
3. Fold again lengthwise. Fig. 99 (*b*).
4. Fold the length in two. Fig. 99 (*c*).

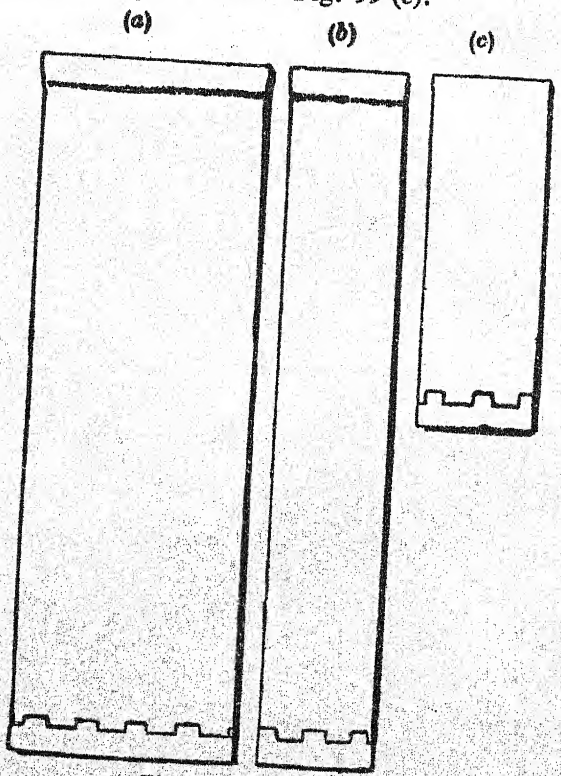


Fig. 99. Fold of a towel.

16

Laundering of Wool

Wool is an animal fibre of delicate texture. It needs careful treatment in laundering because of the tendency of woollens to shrink or stretch in the process of washing. The fibre is covered with overlapping scales of the gelatinous nature. *Moisture, heat and alkali* soften the scales of a fibre ; and if friction is applied, whilst the fibre is in this softened state, it will cause interlocking of the scales, which will result in shrinking and felting. *Alkali* also spoils the texture of the fibre which becomes hard and yellow. *Uneven temperature* too is harmful, as it causes sudden dilation and contraction of the scales and thus, produces shrinking and felting of the fabric. Wool retains a large amount of moisture and is very heavy when wet, and if it is hung up in this state, it stretches downwards and gets out of shape. Therefore, in the laundering of wool, the following should be avoided :

1. Applicalion of friction.

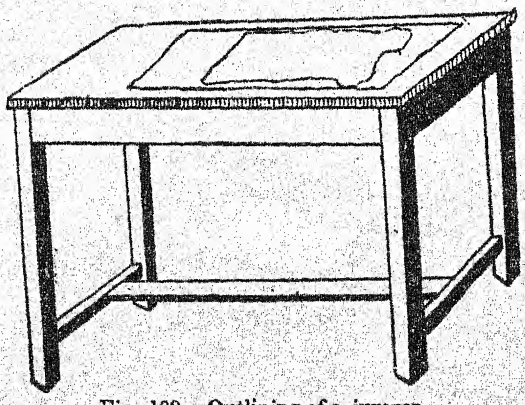


Fig. 100. Outlining of a jumper.

2. Uneven and high temperature.
3. Hanging up of the fabric while wet.
4. Use of alkali.

Preparation. Woollen fabrics are of loose structure and so hold dust particles. Shake the articles to remove the dust. Repair the holes and thin places as these are likely to enlarge during washing.

Hand-knitted garments are liable to felt or loose their shape as they are very loosely knitted. To prevent the felting or spoiling of the shape, mark out the outline of an article before wetting it (Fig. 100). Spread out an old

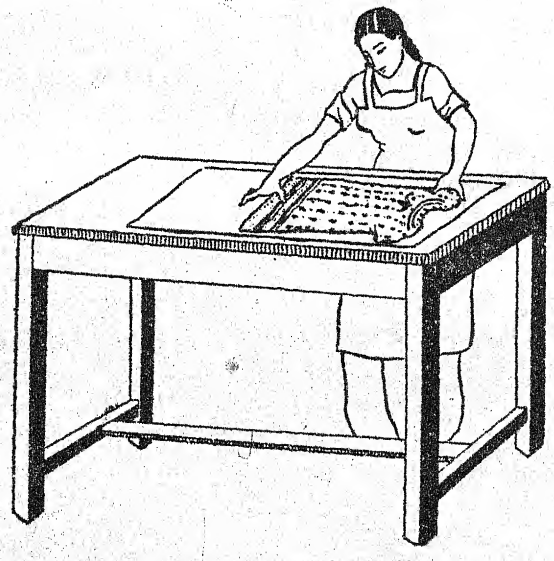


Fig. 101. Placing of a jumper on outline.

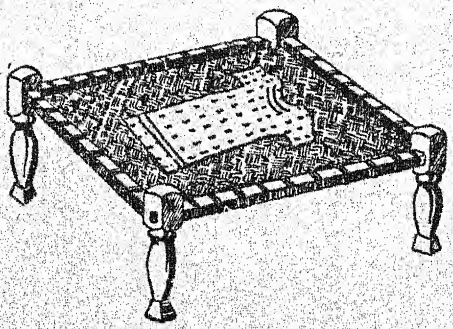


Fig. 102. Drying of a jumper.

newspaper on a table. Place the article on it, pull it to its regular and original shape, and then draw its outline. After washing and removing the moisture, the garment should be placed on the paper and pulled back to its original shape guided by its outline. The garment should be allowed *to dry flat on the paper*, as only thus will it keep its shape (Fig. 101). Drying over a cane surface (Fig. 102) is better than wood, because of better circulation of air. If on a table, the garment must be turned over from time to time.

Stain Removal. Wool does not absorb colouring matter rapidly, so fresh stains are easy to remove. They should be treated at once with cold or warm water according to the nature of the stain. For removing old and stubborn stains, use reagents in weak solutions. Weak acids are less harmful than weak alkalies. If bleaching is done, use only hydrogen peroxide or sodium perborate at a moderate temperature. Javelle water should never be used on wool. All reagents must be used in solutions.

Steeping. For woollens, steeping is not generally used, as long immersion in water weakens the fabric. It is, however, necessary to steep the new woollens, the first time they are washed, to remove the sulphurous acid left over in them from bleaching. It should be done for five to six minutes in warm water, made lightly alkaline with dissolved borax. Children's clothes, which are dirty, should be steeped for ten to fifteen minutes in slightly warm water made alkaline with borax.

Preparation of Water. In washing of wool, preparation of water is important. The water must be soft and just warm. The woollens should be washed and rinsed in water of constant temperature which is 100°—100°F, or luke warm water. So plan the wash and keep enough warm water ready. Alkalies, except borax, damage the texture of the woollen fabrics and so avoid using them. If the water is hard, add a few drops of ammonia to the water for white woollens and borax for white as well as coloured woollens.

Soap. Any neutral soap (such as soap flakes) is good for woollens. Soap jelly can also be used. A soap containing a grease solvent is useful for very soiled articles. Soap solution should be used.

Method of Washing. Prepare a permanent lather with warm water and soap flakes. If the articles are heavy use soap jelly with ammonia to make the lather. For one woollen jacket a

cupful of soap jelly, and two teaspoons of ammonia or borax is needed. For very soiled articles, use the cleansing fluid (Chapter 12) to make a permanent lather. Wash small articles by kneading and squeezing, and the bullky ones by suction washing. Renew the soap solution if the dirt is not removed.

Rinse in several waters of the same temperature for the thorough removal of the soap. If any soap is left in the fabric, it will damage the fabric and give a bad smell to the articles. Use citric acid, *i.e.*, a squeeze of lime juice to the last rinse for white woollens and vinegar for coloured woollens. This will counteract any alkali that is left in the fabric and freshen it.

Removal of moisture is very important as wool retains much moisture, and so takes long to dry. The weight of the moisture may cause stretching if it is not removed thoroughly before drying. But these should never be wrung for removing moisture as the twisting will damage the fabric and also cause felting. The best method is to wrap the articles in a dry cloth or towel and press between the hands if the article is small. Bulky articles should be spread on a flat surface and then pressed with a suction washer or with a wooden roller. If a mangle is available it should be used, for removing the moisture from woollen articles. Pass the articles folded through the mangle at a low tension two or three times till all the moisture is removed.

Drying. Outdoor drying is not advisable as strong sunlight and intense heat affect the texture of the fabric. Dry the woollens in a warm and dry place in a thorough drought. After removing the moisture, shake the article, pull it to shape, and put it for drying as flat as possible. During drying, lift, shake and turn occasionally and pull it to its shape. Large articles which have to be hung, should be put on two or three *laths* or drying rack like a sari so that they do not hang down heavy. Garments should be hung up by their strongest parts.

Finishing. The elasticity of woollen fibre is spoiled, if excessive finishing is applied. So special care must be taken as regards the heat of the iron and the process of finishing applied. All woollens are finished by pressing except the woven fabrics, such as flannel and serge which should be ironed lightly. The woven fabrics should be finished when they are slightly damp. When these materials are dry, place a damped muslin over them and press. Or damp them lightly by rubbing a wet pad of

muslin over the surface evenly and then press.

Knitted jumpers and other small articles need very little finishing if they are shaken and pulled into shape during drying. They are pressed lightly on the right or wrong side according to the colour and the type of garment when they are dry. The inherent moisture content of the fabric is sufficient to give the required dampness for finishing. Knitted woollens that need a very smooth finish, should be steam-pressed when dry on the right or wrong side according to the type of the material. (Note for steam-pressing see Chapter 14). Woollens with a fluffy finish, *e.g.*, rabbit wool is finished when dry by brushing it with a dry stiff brush or a teasel brush.

Crepe woollens shrink to a large extent in washing and so special precautions have to be taken. These should be measured before washing, stretched during drying process and steam-pressed (on the wrong side) to the correct shape and size in finishing. It is better to dry-clean them.

Coloured Woollens. For fast coloured woollens, the method given above should be followed. To retain the colour of the fabric, the important factors to be avoided are (*i*) heat, (*ii*) the use of alkali, and (*iii*) long immersion in water. If running is noticed, add acetic acid, vinegar or lime juice to the final rinse to revive the colour.

For *woollens not fast in colour* use reeta nut solution for washing and add acetic acid or vinegar to the washing and rinsing waters. Washing must be done quickly. Remove the moisture carefully and thoroughly to prevent colour spreading. It is advisable, if the colour is bleeding too much, to use an old piece of cloth between the folds of the materials, while the material is squeezed to remove the moisture. Place the article as flat as possible without folds for drying. Place it where drying can take place speedily.

Finishing is done on the wrong side for all types of coloured material to avoid glaze. Care should be taken to clean the iron and change the ironing sheet, if stained, before using them to iron other garments.

Laundering of Blankets and other heavy articles. It is not very easy to clean heavy woollens, such as overcoats, rugs and blankets. These get very dirty and need a thorough treatment when cleansing is attempted. All the rules given above for washing of woollen are also applicable here. Suction washing is the

most practicable method to use for cleaning them. A big tub and a long handled suction washer are necessary. For coloured articles reeta nut solution is safe to use. Take sufficient reeta nut solution to give a permanent lather. Add warm water enough to cover the blanket. To this solution add 1½ to 2 tablespoons of borax and 2 oz. of methylated spirit. Shake the solution thoroughly with the soap. Place the article in it for five minutes to saturate it. Then work the suction washer for three or four minutes at a low rate. If the article is still dirty, use a fresh mixture of cleansing solution and repeat the process. A number of articles can be washed at the same time, but care should be taken to allow plenty of water to soak through and cover the articles thoroughly.

Rinsing must be done thoroughly as heavy woollens have a tendency to retain soap. Rinse in several waters of the same temperature. Remove the moisture as much as is possible by pressing the articles on a flat surface. Use of a mangle is very convenient for this purpose and ensures the removal of moisture. Heavy woollens retain much moisture and take a very long time to dry and so should be dried out of doors in the shade. Rugs and blankets should be folded in half and hung on a taut line and fixed with pegs to ensure their drying in shape. Shake and turn during drying and thus no finishing will be required. Moisture is harmful to woollens and so, always wash them on a dry day, so that they can be dried out of doors.

The overcoats and dressing gowns should be hung by the shoulders and pegged securely to the line. A wooden rod or a hanger may be passed through the sleeves to give a good support to the heavy parts of the article. These may be finished by pressing on the wrong or right side according to the colour of the article. If the fabric of the article is fluffy in appearance, steam finishing should be done.

Pashmina Shawls. These have a fine, and soft texture and should be cleansed with great care.

Use reeta nut solution, and wash using a suction washer. Rinse several times. To the final rinse add lemon juice and glycerine in the proportion of 2 teaspoons and 1 teaspoon respectively to one gallon of water. Remove the shawl from the rinsing water and press it in between a towel to remove the moisture. Place it to dry as for blankets. Shake it several times whilst drying. This does not need any finish.

Note. If the shawl is very dirty, add ½ tablespoon of cleansing fluid to the reeta nut solution.

Serge and Gaberdine. Magnesium salts are added as dressing in serge and gaberdine, and these cause considerable difficulty in washing, if soap is used. Soap leaves white and streaky marks on the garment, which are more pronounced on dark coloured articles. These fabrics, therefore, should be cleaned either with glue wash or with Sal Ammoniac (Naushadar) (Chapter 12). If very dirty, a mixture of reeta nut and cleansing fluid (½ a tablespoon cleansing fluid to a gallon of reeta nut solution) may be used. Dark coloured, especially blue serges, should be rinsed with warm blue water. This helps to restore the colour.

Note. Even though good care is taken, white woollens develop a yellowish colour after a number of washes. These, therefore, need bleaching. Either of the treatments given below is quite effective.

Method 1. Dissolve 1 oz. of oxalic acid in one gallon of water, in a wooden tub. Dip the article (previously washed and dried) in the bath, let it soak for five to ten minutes, turning it over and over now and then. Remove, wash and rinse thoroughly to remove all the traces of oxalic acid. Blue and dry the articles.

Method 2. Place a piece of rock sulphur (Gandhak) on live charcoal in an earthen bowl. Cover this with a clean wicker, bamboo or cane basket. Spread the half-dry washed article on the basket. Cover the basket with a big tub or a tin, which should not touch the material and allow the fumes of sulphur to collect and permeate through the article for five to ten minutes. These fumes will bleach off the yellow stains. Air the article to remove the sulphur smell.

17

Laundering of Silks

Silk is another animal fibre of delicate and fine texture which needs special care in laundering. It is, however, unlike wool in some important respects. It does not shrink and felt or lose its shape like wool. This is so, because the silk fibres are long, smooth and without the characteristic scales of wool. It is cleaned in very much the same way as wool. In case of silk, strong alkalies, heat, and friction are equally harmful. Since it is an animal fibre with the nitrogenous content, the alkali and heat harden the texture of the fibre and discolour it, specially the white fabrics which become yellow. Too much friction weakens the strength of the material.

Silks are available in many qualities with different textures, such as velvet, georgette, crepes etc. Silks are also mixed with wool, cotton and linen. Special rules are observed in their treatment, of which the basic principles are the same, namely, to avoid *heat*, *friction* and *alkali*.

Preparation. Repair tears and openings in the seams, if any, before washing, as these are likely to enlarge during the washing process. The knitted silks must be examined for ladders and these must be mended.

Stain-removing. Fresh stains are preferably removed, if possible, with cold or warm water according to the nature of the stain. Strong acids and alkalis and strong bleaching agents are harmful to silk. Acid stain removing reagents are less harmful than alkali (as in the case of wool). For old stains which are difficult to remove, use weak reagents, such as weak solutions of borax, or sodium perborate for coloured silk, and hydrogen

peroxide with a few drops of ammonia for white silk. Javelle water should never be used on silks as this will damage the fibre very much. When using reagents and bleaches, special care should be taken as regards the strength and temperature of the reagent and the length of its contacts with the fabric. Grease spots are not removed in the process of washing and so, these too should be removed with a grease solvent *before* washing.

Steeping. Steeping is not essential because silk is cleaned easily. Very soiled white and pale coloured silks which are discoloured by wear may be steeped in warm water for a short time. A small proportion of borax, added to the water, will make it more effective.

Soap and Water. Silk material is of fine texture and is usually an expensive fabric, so a good neutral soap should be used. Soap flakes are suitable, so is soap fluid (see Chapter 12 for a recipe) and reeta nut solution. Water for silk must be soft.

Preparation of Soap Solution. Dissolve soap in hot water and then add sufficient cold water to reduce the solution to lukewarm temperature (100 to 110°F). If the water is hard, then add ½ a teaspoonful of borax or ammonia to soften it.

If reeta-nut solution is used, strain it through a muslin before mixing it with more water.

Process of Cleansing. Cleansing is done by kneading and squeezing or by suction washing. Place the article in the washing solution, allow it to be saturated with soap and then either knead and squeeze or suction-wash, according to the size of the article. Rub lightly the most soiled parts with additional lather. If the articles are very soiled, add a little more borax or ammonia to the cleansing solution. Cleansing fluid may also be used for very dirty silks.

Rinse the silks in two or three warm waters to remove the soiled soap from the fabric. Add a few drops of citric acid (Nimbu Ka Ras) or acetic acid to the last rinse, which should be of cold water. The addition of citric or acetic acid to the final rinse improves the sheen of the fabric.

Stiffening of Silk. There is a natural gum in the silk fibre, which is stiffened by the final cold rinse, giving a light stiffness to the article. If extra stiffness is necessary, add gum water to the last rinse (2 tea spoonfuls to a quart of water). For shirt

fronts, cuffs and collars, more stiffening is required and so, more gum water is added.

Silks should be squeezed lightly by hand to remove the moisture.

Drying. Heat must be avoided and so, drying of silk is not done in the sun. Small articles need no drying. After removing the moisture these are rolled in a dry cloth for half an hour before ironing. Big articles and thick silks should be partly but evenly dried by hanging these in a shady place or indoors. Silks cannot, subsequently, be damped for ironing, as the silk fibre is not hygroscopic and the moisture will not be distributed evenly, and will leave water spots. So silk is not to be completely dried but kept slightly damp for finishing. But wild or Tussore Silk should be dried *completely* before finishing. This type of silk has more natural gum, which melts with the heat of the iron, and smoothens the material, and thus, makes the ironing easier.

Finishing. Since silk is an animal fibre, and liable to be spoiled by the appliance of excessive heat, special precautions must be taken in finishing it. A hot iron will scorch the silk, whilst a cold one will drag and crease the surface of the silk instead of giving it a smooth finish. The heat of the iron should be tested on a piece of paper. If no mark is left on the paper until you have counted three, the temperature is correct for the silk.

Wild or Tussore silks are ironed on the right and wrong sides, according to their colour and surface finish. All dark colours are ironed on the wrong side to avoid a glaze.

Cultivated silks must be ironed, when evenly damp, to get a uniform and smooth finish. Uneven dampness will give patches or water marks and creases. All silks should be ironed till they are dry or creases will reappear on the portions left damp.

Coloured Silks. Fast coloured silks are treated in the same way as white silks. To revive the freshness of the colour, use vinegar or citric acid in the last rinse. Never use salt to prevent the colour from bleeding.

Silks of doubtful colour should be tested for colour bleeding on a portion of inner seam or some other unimportant part of the article. Dry cleaning is advisable for unstable colours. Silks with doubtful colours, if washed, should be treated with special care. Steep the article for one or two minutes in cold water with two or three teaspoonfuls of vinegar or a few drops

of acetic acid. Then wash quickly in lukewarm or almost cold water. Rinse in several waters. In case of colour bleeding, use acid in all the rinsing waters. Squeeze out the moisture, then place it in a white cotton with another piece of cotton between the folds and press the moisture out. This will prevent the uneven colour patches on the surface. Half dry and finish as explained above.

Knitted Silks. These have the tendency of losing their shape and so, it is advisable to measure them before they are wetted. Treat these in the same way as woven wool except that care should be taken not to pull or stretch them while wet. Squeeze in a turkish towel to remove moisture. After washing, measure and draw these to their original shape and size. Dry as flat as possible to prevent stretching. Finishing is done by pressing these on the wrong side when damp. Ironing will stretch the material.

Neckties. These are best dry cleaned. If washed, the padding must be tacked all over. If the colour is doubtful, the padding should be removed before laundering. Place the ties flat on a board after wetting them. Apply soap lather and scrub these lightly with a soft brush until clean. Rinse in two or three lukewarm waters and finally in cold water. Then place them flat on a turkish towel, and press them to remove moisture. Pull them to their original shape and allow to dry. When almost dry, press with a moderately hot iron on a thick flannel pad. The tacking on the padding, when done, should be removed, *before* pressing. Ribbons are treated in the same way as neckties except that the temperature of the water should be much lower.

Scarves are washed in the same way as silk, according to their colour and surface finish. But special attention must be paid to their ironing. Scarves are usually made on cross-cut or bias material. To retain their shape, they must be ironed along the warp threads.

Velvet. This is a silk pile fabric. Washing is not very suitable as the soft pile is spoiled. Velvet articles, which are very old and very dirty, can be washed in reeta nut solution by gentle kneading and squeezing process. Before wetting the article, it should be brushed thoroughly to remove lose dirt. Rinse the article well in two or three waters and then gently press it to remove the excess of water. Brush it lightly on the right side while wet, and half dry it. Then press it lightly on the wrong

side with a warm iron and then steam it to raise its fluff.

Method of Steaming. Boil some water in a deep vessel. Cover its mouth by tying a piece of fine muslin. When the steam comes out, hold the right side of the article in contact with the steam only for two or three minutes. Then turn it, to let the steam pass through the fabric from the wrong side to the right. At intervals, brush the right side gently and continue this process until all the pile is raised and the article is dry.

New Velvets. Washing should be avoided. If dry cleaning is not possible, these should be steamed by passing alkaline steam through the dirty part of the garment and brushing it gently. Alkaline steam is obtained by adding rita nuts or soap flakes to the boiling water. Dirt spots can also be removed with soap lather. Add ½ teaspoon of kerosene to the soap solution and apply the lather to the dirty part with a circular movement. Finish it by steam pressing. Stand a moderately hot iron on its heel and cover it with a damp cloth. Hold the velvet in front of the iron so that the steam passes through the fabric. Hang the velvet again to dry or else it will crease again if any dampness is left from steaming.

Dry Cleaning of Velvets. Any dry cleaning solvents such as petrol, benzine or mineral turpentine, or any absorbents, such as French chalk or talcum powders can be used. If absorbent powders are used, the powder should be sprinkled and left for 24 hours. Then it should be brushed off thoroughly. Steam press it to finish the article. If solvents are used to clean velvet, precaution should be taken to see that all of the solvent has evaporated before it is steam pressed.

Georgette and Crepes. Pure georgettes and crepes are easier to launder than the mixed fabrics. Georgettes, with deep crepe finish, and with the mixed yarn are liable to shrink in washing. It is best to dry clean them. Crepe de chine, which has a slight crepe finish, can be washed successfully. Use soap flakes, a neutral soap, or a grease solvent prepared in solution, to cleanse these fabrics. Treat them in the same way as silks, according to their colour. Squeeze out lightly to remove moisture. Stretch it lightly to regain its size and let it dry. Whilst drying pull the fabrics once or twice to stretch it. Stretch a portion of the article at a time to its original size and then iron it till it is completely dry. These fabrics are ironed on the wrong side. A thick towel may be used on top for ironing. This makes the ironing easy and gives a uniform finish.

Saris usually shrink, and cause much difficulty in laundering. While stretching to its original size, use of a wooden roller of a thickness of 2″ in diameter and about 50″ in length makes the work easy (Fig. 103). Before wetting the sari, mark its width on the roller. After washing and removing the moisture, roll the

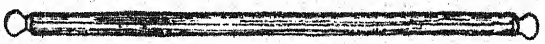


Fig. 103. Wooden roller.

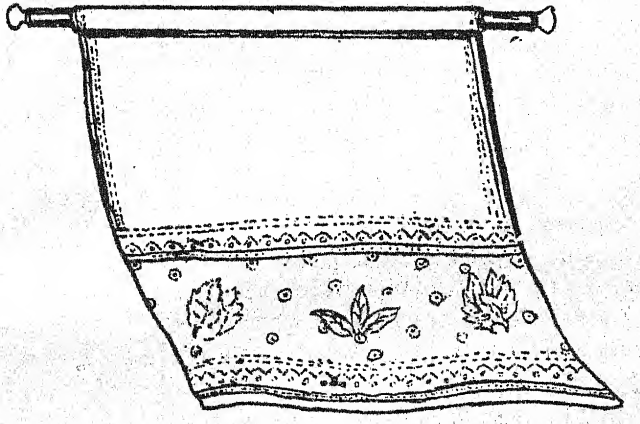


Fig. 104. Drying of a Georgette Sari on a roller.

sari firmly and evenly on the roller, stretch it to its original width, which has been previously marked on the roller (Fig. 104). The stretching and the tight rolling will also minimise the shrinking in length. The sari should be left to dry on the roller. When the top layers are dry, unwind these gradually and roll them on to another roller. This will quicken the drying. This device minimises the finishing process as the sari treated as above needs only light pressing.

Chiffons. These are pure silk fabrics or a mixture of silk and artificial silk. These are best dry cleaned. If washed, these are treated like georgettes and crepe.

Weighted Silks. These are not suitable for wear as they are usually destroyed by perspiration. The housewife should avoid buying these silks. The burning test will help her to identify this type. The weighted silk blackens and retains its shape after burning, whilst the pure silk forms a brittle ball.

Dry cleaning of these is better than washing. The ironing also must be done very carefully. Too hot an iron or too much pressure should be avoided as either will destroy the fabric.

18

Laundering of Rayons and other Synthetic Fabrics

Rayons are artificial fibres derived from cellulose. These are made either from regenerated cellulose or from cellulose acetate, and are, accordingly, classified into two main groups. The characteristics of each group and their reactions to water, heat, cleansing and stain removing reagents must be borne in mind while laundering these fabrics. (See Chapter 8 for Properties of Rayons.)

In cleaning rayons, care must, therefore, be taken to maintain the shape and appearance of the material and to avoid such processes and effects as are likely to injure the fabrics. For example, application of heat and alcohols will destroy the cellulose acetate rayons, and the rayons made from regenerated cellulose will be weakened if steeped in water. From appearance alone, it is difficult to judge any type of rayon and, therefore, it is advisable to follow a general rule, namely to avoid steeping, heat, application of strong chemicals and alcohols.

Rayons have no natural elasticity. Hence, the stretching of them in the processs of laundering might tear the material. On the other hand, a number of knitted fabrics made of rayon yarn stretch and get out of shape. Hence, the cleansing of rayons needs great care.

Preparations. Rayons are very often attacked by insects which eat up the fabrics in places, leaving small holes all over the surface. These should be darned and any openings, etc., should be mended.

Stain removal from rayons is rather difficult owing to the harmful effect on them of the cleansing materials and chemicals. However, the stains should be treated carefully following the rules given in Chapter 13.

The fabric should be tested for colour fastness before wetting them. Good quality and expensive rayons are best *dry cleaned.*

Washing. Rayons are washed in the same way as silks. The soap should be neutral, and the water soft, and not above 100°F in temperature.

Make a free and permanent lather of soap in water. Open out the garment in the soap solution and wash it with light kneading and squeezing method. Rayon articles should not remain in water for long and so, kneading and squeezing should be swift. When articles are lifted out of water, their weight must be supported with the hands or they should be placed on a draining board. If allowed to hang in mid air, they will stretch and may tear. Soiled parts should be carefully rubbed with soap lather, but rubbing with soap cake should be avoided.

Removal of Moisture. Squeeze the fabric between the palms of hands to remove the moisture. It is still safer to wrap the article in a towel and squeeze the two together. Use of a rubber wringer for this purpose is not harmful, but wringing by hand is very dangerous, specially for knitted fabrics, as their shape will be spoiled completely.

Drying. Rayons should be protected from heat and so, drying in the sun should be avoided. Rayon articles should be spread out in the proper shape to ensure even drying, by air. Uneven drying may cause water marks. Sufficient moisture may be left in the article to get a good finish after ironing, but on no account should the fabric remain wet in places.

The article, if hung on a line, should have its weight equally distributed on both sides of the line. More weight on one side may stretch the article. Clips are not used. It is best to lay the article flat on a table or board, or even on a towel-covered bed, to pull it to shape, and leave it to dry. Another device is to insert a towel-covered pillow or cushion in a blouse and to stand it up, or lay it flat, turning it over every 15/20 minutes till both sides are dry.

Ironing. Rayon fabrics are usually turned out into sewn garments except in saris. For ironing, a skirt and a sleeve board is necessary. A large piece of muslin and a bowl of water

should be at hand. Thermostatic-controlled irons are particularly suitable, as these will not cause harm to the fabric by getting overheated. Electric or charcoal irons should be carefully used. Iron the rayons with a moderately hot iron on the wrong side. If the dampness is not sufficient, then iron the article with a muslin spread over it, *but never sprinkle water on the article.* Edges, hems and other double parts should not be ironed first. This may cause the main parts of the article to be stretched. The main parts of the article are ironed first. The seams, edgings and other trimmings are then finished.

Tucks and gathers should not be pressed, but pleats are pressed. To avoid stretching of the article and specially the knitted article, iron the rayons across the width except when stretching in the opposite direction.

Airing. Articles after ironing may appear dry, but may contain some moisture, which if not removed will spoil the good finish and make the texture limp. Hence, a thorough airing of the article is necessary.

Note. Some rayon fabrics, such as cellulose acetate, shrink, or get gathered up during the process of washing. Such articles should be ironed wet, stretching each way in width and length until the correct size and shape are obtained. In some cases, this is not possible as the wet rayon fabric sticks to the iron and tears. In case of such articles, the method used for woollen jumpers (drawing its outline on paper before wetting the garment, and then drying it on the paper, pulling it to fit the outline during the process of dying) is used.

Rayons are manufactured to replace silk, and therefore, rayon yarns are woven and knitted to give a large variety of fabrics just as they are in silk. The same rules and methods as for silks should be followed in cleansing this variety of fabrics also, but, at the same time, the peculiar properties of rayons should also be kept in view.

Fabrics with a rayon mixture should be treated as a purely rayon fabric.

LAUNDERING OF OTHER SYNTHETIC FABRICS

Other synthetic fabrics such as polyamides—polyesters, aceytics and acetate are easy to care fabrics.

They are hydrophobic fabrics; that is they do not absorb moisture readily. This contributes to speedy drying and is responsible for resistance to shrinkage and spotting.

Most of them are thermoplastic; it means that only light pressing with low heat iron is necessary to restore the original appearance of a fabric.

The smooth and soft surface of these fabrics resists dirt and grease and so remains fresh and cleaner for a longer period.

They are strong fabrics, which are not much affected by chemicals, moth, mildew and sunlight. So all these factors contribute towards their easy care.

GENERAL RULES FOR LAUNDERING

PREPARATION

Examine garments and do the necessary mending to avoid further fraying and tearing of the fabrics. Remove non-washable trimmings, close buttons and zippers. Locate the stains and remove them according to the type and the nature of the stain and the type of fabric. Care should be taken in the care of acetates because acetone and alcohols dissolve acetate and leave holes behind.

LAUNDERING

Check labels for washing instructions, if not given then follow general rules for good laundering.

These fabrics do not require any steeping unless they are extremely dirty and even then a small exposure to lukewarm water would suffice. They can be either machine-washed or hand-laundered. Sheer, delicate and fine fabrics should be hand-laundered to retain the freshness and smoothness of the fabrics. Lukewarm water, mild soap suds gently squeezed through the fabric will remove the soil easily. Heavily soiled parts will require extra gentle rub with soap suds. Rinse thoroughly with warm water to remove soap completely, otherwise the soap particles will dull colours and cloud pure whiteness. As with any fabric it is best to wash white garments separately from coloured to avoid the above mentioned defects.

Avoid putting needless wrinkles into the fabrics during the laundering process. Lightly squeeze out excess moisture, roll it into a bath towel, smooth and allow it to dry. The fabric can also be hung dripping wet, after the buttons have been fastened and collars and cuffs finger-pressed. This way the fabric will require minimum or no ironing at all.

IRONING

These synthetic fabrics and their blends should be ironed at low temperature setting while still damp with little or no pressure. Because they have a tendency to glaze and melt under heat and pressure. They can be stored indefinitely without any deterioration.

19

Treatment of Special Articles

Lace is a fine open fabric of linen, cotton, silk, gold or silver threads woven in patterns. It is either hand or machine made (Fig.105). Because of its delicate texture, lace needs very careful laundering.

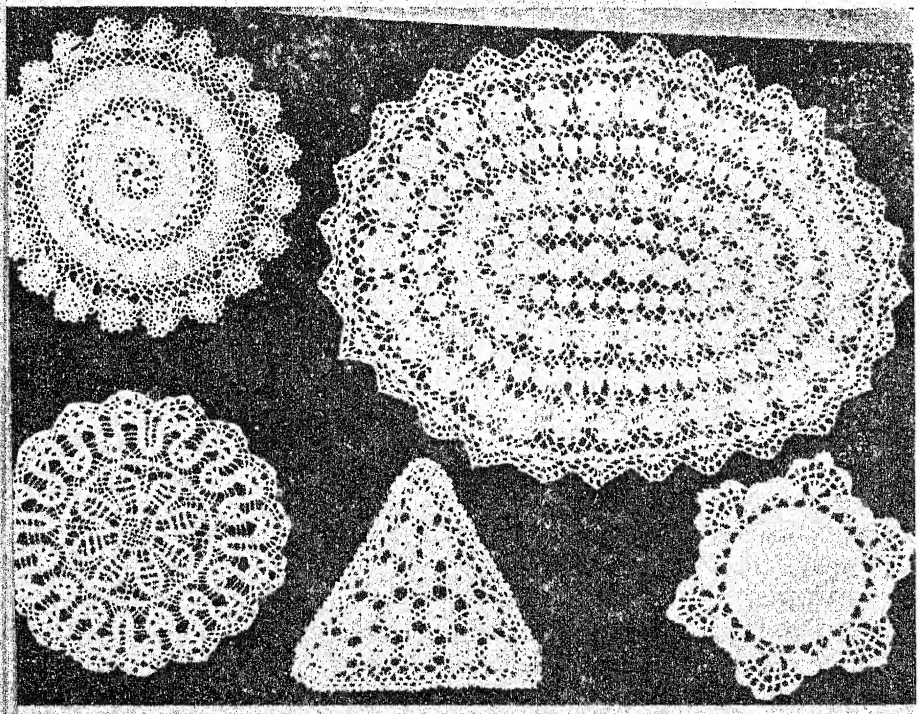


Fig. 105. Hand made lace *d, e*. Machine made lace *a, b, c*.

Linen and Cotton Lace. These are generally white, and are cleaned in the same manner as white cotton and linen. Precautions must, however, be taken to prevent the breaking of threads.

Preparation. Examine the article and mend, if necessary. Ornamental lace pieces such as collars, scarves, dress fronts, and also lace mats which have pointed edges, scallops, etc., are tacked on an old piece of white clean material. This makes their handling easier and safer.

Stain removal. Same reagents as for cotton are used, but these must always be in solutions.

Steeping. Laces are steeped if these are very dirty in water to which borax (1 teaspoon to a pint) is added.

Washing. Wash laces with the squeezing method. Use soap in solution.

Boiling. White lace articles are boiled. A boiling bag must be used.

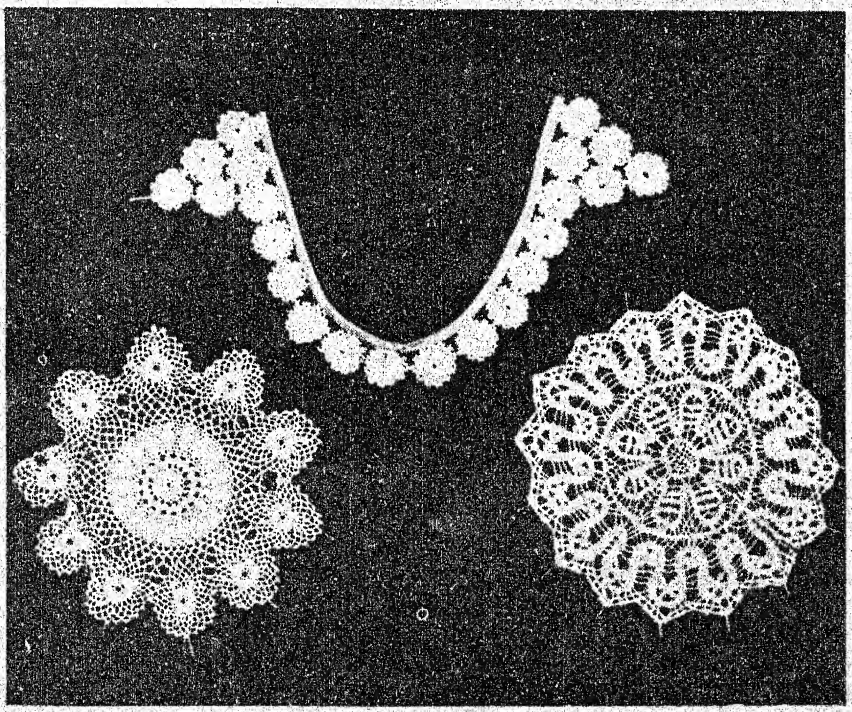


Fig. 106 Drying of lace.

Rinsing. Rinse several times in clean water.

Stiffening. Starch the articles according to the stiffness required. *Blue* is added to the starch for white laces.

Removal of Moisture. Wrap the articles in a towel to remove moisture. Do not squeeze or wring.

Drying. Dry these flat on any flat surface.

Note. If an article is not tacked on a cloth, then it should be spread on a flat surface. Lightly pull it to its shape, and pin it down as shown in Fig. 106.

Finishing. Laces do not need much finish. These can be lightly pressed, if necessary.

Silk laces. These are usually made of fine threads, and need even more care in laundering.

These are washed in the same manner as silk.

For fine articles such as collars, scarves etc., a wide-necked

Fig. 107. Washing of narrow lace.

bottle or a jar is used. Place the article in the bottle. Add soap solution. Cork or cover the bottle and shake it vigorously. Pour out the dirty soap, add clean water. Repeat the process changing the water each time until the article is clean. Long lace borders are tacked on a strip of a clean, white old cloth. This is then wrapped round a wooden rod or a long narrow bottle (Fig. 107). Hold the entire bottle or rod in the prepared soapy solution, and briskly whirl or agitate the solution with it for five to seven minutes. Replace the soap solution with clean water and repeat the whirling process. Change the water several times until all the soap is washed off the article. Do not unwrap the lace from the bottle or rod but remove the moisture from the article by pressing it with a towel. Leave it in any airy place to dry, still wrapped round the bottle or rod.

Faded laces. Silk laces are usually in various shades of colours. The colour fades in old laces by ageing. To revive the colour, the articles are dipped in a suitable tinting lotion. For cream colours, use tea or coffee extract obtained by boiling tea leaves or coffee in water. Dilute it as required.

For other colours, a suitable dye is used to make the colour solution.

Use of tinting solution. Tinting solution is added to gum water or starch if stiffening is needed to be given to the articles.

All articles that require the same shade of tinting should be put into the solution together.

Squeeze the article well in the solution to get a thorough penetration into the fabric and also to obtain an even shade.

For removal of moisture, drying and finishing, follow the same process as for cotton laces.

Gold and silver laces. These are cleaned in reeta-nut solution.

Use a soft brush, dip it into the solution and apply the lather with it to the lace. Gently rub the surface with the brush. Sponge it with clean water to remove the soap. Wipe off the moisture by pressing a small portion at a time with a towel or any other soft cloth.

If pure gold or silver threads are not used in laces, these get tarnished. To remove this blemish, make a paste of French chalk and methylated spirit, cover the lace with this paste. When dry, brush it off. Lightly polish with a soft cloth.

Borders embroidered in gold and silver. Treat these the same way as gold and silver laces.

Borders embroidered with silk. These are cleaned with reeta-nut solution.

Examine the borders for tears and mend these. Remove stains if any and use reagents in solutions.

Test the colour. If colour bleeds, dry clean the borders.

For fast colours, prepare reeta nut solution in a basin. Wet a small portion of the border at a time in the solution. Place it on a flat surface and brush it with a soft brush dipped in the solution, following the pattern of the border.

Rinse several times in clean water.

Add gum water and a few drops of acetic or tartaric acid to the final rinse. Wrap in a towel to remove moisture. Half dry and then finish by placing these on a flannel pad, and pressing on the wrong side.

Carpets and Rugs. Carpets and rugs have generally piled surface and hence, these collect a lot of dust.

Use a vacuum cleaner (if available) to suck in and, thus, remove the dust embedded in the carpet. Failing a vacuum cleaner, hang the carpet and beat it well on the wrong side. Brush the right side from time to time to remove as much dust as possible. Change sides and repeat the process.

Spread the carpet face upwards flat on the ground (preferably on a lawn if available). Make a mixture of reeta nut solution and cleansing fluid (½ tablespoon of cleansing fluid to 1 pint of reeta nut solution). Place the mixture in one bowl and have two other bowls at hand filled with warm water. Put a clean rag in each of the bowls.

Apply the cleansing mixture over a small portion of the carpet working in a circular movement. Sponge it with clean water and a clean rag. When the rag or the water in one bowl gets dirty, use the second rag in the second bowl of water. Repeat till the soap is removed. Wipe the excess of moisture with a clean dry rag. Work on in the same way till the whole carpet is cleaned. Soapless foaming detergents are now also available, the rugs can be cleaned with these with a sponge or rag.

Leave it to dry in an open airy place.

Fur Coats. These are likely to hold a lot of dust which should be thoroughly brushed out.

Small fur articles are cleaned by steeping these in petrol in a jar. Cover the jar well after the fur has been put in and leave it overnight.

For big coats, unless they are sent to dry-cleaners, cleaning by sponging is necessary.

First, brush the article well. Then place the dirty portions on a blotting paper, sponge it with petrol. Allow the petrol to soak through the garment. The petrol will loosen the dirt which will be absorbed by the blotting paper.

After cleaning with petrol, leave the fur to air, and allow the petrol to evaporate.

Sprinkle starch (rice powder or maida) all over the surface, leave it for a day. Brush off the starch. Examine the article for any dirty spots. Treat these with petrol as before. Leave it to air.

Sprinkle French Chalk or Fuller's Earth over the fur, wrap it in a sheet and leave it for twenty-four hours.

Brush it thoroughly to remove all the powder. Air it.

Finally steam press the coat. Whilst steaming, brush continually. This treatment will revive the natural appearance of the fur.

Gloves. Gloves may be made of some fabric or of leather.

If of some fabric, clean these with any cleansing method that is suitable for the particular fabric.

Chamois Leather Gloves and Kid Cloves. Put on the gloves, and wash the gloved hands in soapy solution. Rub the fingers and wrists briskly with extra lather. Rinse in warm water. Add 1 teaspoon of salad oil to help the softening of lather. Repeat washing in soap solution if still dirty. Rinse in clean water.

Remove the moisture by wiping with a dry cloth. Take off the gloves from the hands and leave them to dry. Open and blow into them well at intervals. When dry dust talcum powder inside and outside. Leave it for 24 hours. Brush off the powder.

If very dirty, steep them in dilute ammonia bath (1 teaspoon of ammonia to 1 pint of water).

Then clean as described above.

Straw and Felt Hats. Remove the lining, and trimmings which should be cleaned separately.

Stuff the hat with paper or cloth to keep it in shape. Place it on a table. Brush it with lukewarm water using a soft brush. Work all over the hat, taking care note to spoil its shape.

Add oxalic acid to cold water, about 6 to 8 drops to a pint of water. Brush the hat with this solution, and leave it in the sun.

Replace the paper stuffing with a fresh dry one. Brush the hat well.

If any stains are still left, use petrol or any grease solvent to remove these.

Sponge with a solution of solvent soap. Brush with clean water. Leave it to dry.

For black straw hats, after cleaning, apply a mixture of equal parts of black ink and gum water.

Finally steam the hat by holding this in front of a kettle of boiling water, work it into shape.

Dry the hat in a warm airy place to quicken the process of drying.

20

Dry Cleaning

Cleansing with water and soap is not always possible or advisable for all kinds of fabrics. Some rich and expensive silks, rayons and woollens lose their lustre, sheen, and rich texture when washed. Such fabrics are cleansed by a method called dry-cleaning.

Dry cleaning is really not dry, but it is cleaning with grease solvents other than the soap solution. Dry cleaning may be done by grease absorbents also. In dry cleaning, therefore, soap and water are replaced by what are called 'Dry Cleaning Reagents'.

There are two methods of dry cleaning :—

BY MEANS OF GREASE ABSORBENTS

There may be some dry absorbent like Fuller's Earth, French chalk, Talcum Powder, Salt, Bran, Bread Crumbs, Baked Flour, Powdered Sulphur. One of these powders is sprinkled or rubbed into the article to be cleaned. This is then folded to allow the powder to absorb the grease. Since the grease holds the dirt the garment is now easy to clean.

BY MEANS OF VOLATILE GREASE SOLVENTS

These chemicals are all liquids and easily penetrate the garments but do not wet them as does water, and these liquids easily evaporate in air. Examples of grease-solvents are petrol, ether, methylated spirit, chloroform, carbon tetrachloride, tri-chloro-ethylene, mineral turpentine and a latest patent product of ICI known simply as Solvent. Of those petrol, benzine, methylated spirit easily catch fire ; they must therefore be used with greatest

care and kept away from any flame or hot object. Carbon tetrachloride, trichloro-ethylene are fire resistant but their vapours produce insensibility if inhaled for a long time.

All these substances are harmless to dyes and dissovle grease, which is the basis of so many ugly stains on the fabrics.

The dry cleaning process may by performed by :

(*a*) the immersion of garments in a grease solvent in order to dissolve the grease.

(*b*) Spot cleaning by sponging dirty spots with a grease solvent.

(*c*) Absorption of grease by powders, (*i*) sprinkled on dirty spots or by (*ii*) application of a paste made of a grease absorbent powder and a grease solvent.

GENERAL RULES

Preparation. As in washing, the articles must be 'prepared' for dry cleaning. The preparation consists of :—

(*a*) examination of the article

(*b*) mending wherever necessary

(*c*) removal of metal trimmings and buttons and emptying of pockets,

(*d*) brushing, which must be thorough enough to remove all loose dust, and

(*e*) stain removal. All stains, except the grease stains, should be removed. Grease stains will be removed in the process of cleaning itself. After the removal of stains, the article should be allowed to dry, before it is put in the dry-cleaning bath.

Cleaning. The article is thoroughly wetted and cleaned in plenty of petrol. Therefore, the requirements for this method are:

(*a*) a container for petrol and the article,

(*b*) a wooden spoon with a long handle,

(*c*) a wooden rod or a suction washer, and

(*d*) a basin.

The container should not have a wide mouth or quite a lot of petrol will be lost by evaporation. A cylinder-shaped vessel, with a narrow mouth, *e.g.* an old drum of medium size is advisable. A lid to fit the mouth could be easily made, so that the drum could be closed after filling it with petrol and placing

the article in. This will minimise the evaporation of petrol to a large extent.

The use of a dry cleaning pump shown in Fig. 80, described in chapter 11 is a great help in dry cleaning. This will not only prevent the evaporation of petrol, but will minimise any danger of catching fire and will further clean the article thoroughly. The place chosen for working should be far away from any source of heat to guard against accidental fire.

Method. Pour sufficient petrol in the container and immerse the articles in it, pressing it down with a wooden rod. Then stir it thoroughly, close the lid, if any, and shake the container so that the petrol and the article are in continuous motion. A suction washer may be used in place of a wooden rod. Allow 5 to 15 minutes for the process, according to the size of the article and the quantity of dirt in it.

Lift up the garment and wrap it round and round the wooden rod and then press the material on the rod with a wooden spoon to squeeze out as much of the petrol as possible. Place the article in a basin and press it on one side with the wooden spoon to extract more petrol from the article.

Then strain the petrol through a filter, paper, blotting paper, or a piece of muslin into a can or a bottle and close the can with a screw type of lid. Label the can to indicate that the petrol in it has been used once.

If the petrol used gets very dirty before the article has been properly cleaned then the whole process should be repeated again with a fresh lot of petrol. This is called rinsing. The second lot of petrol is bottled in a separate bottle and labelled accordingly.

Important. The process of cleansing, rinsing, straining and bottling of petrol should be carried out with speed to minimise evaporation.

Drying. Hang the articles to dry for a day in a shady place away from the sun and fire and in plenty of draught preferably outside in the open for a day at least, so that all traces of petrol and its odour disappears.

Finishing. As long as the petrol odour remains in the article, it should not be ironed. The article should be finished according to its type and texture as described under finishing in chapter 14.

Sponging dirty spots. The requirements are (*i*) an ironing table covered with blanket and sheet, (*ii*) a bottle of petrol, (*iii*) a small bowl, (*iv*) blotting paper and (*v*) a piece of muslin.

After preparing the article as above, note its more dirty parts which must be cleaned first. For example, if it is a coat, the neck, the armpits and the cuffs are soiled more than the rest of the article. Therefore, these are to be cleaned first. Then any particularly soiled spot is noted and this is then cleaned.

Method. Spread a piece of blotting paper on the prepared table. Place the soiled part of the garment on a piece of blotting paper in such a way that the dirty side is in contact with the paper. Wet a piece of muslin with petrol and damp the soiled part of the garment by sponging on the uppermost side. The sponging is to be done by a circular movement beginning at the edge of the soiled portion and ending at its centre. Continue this process until all the dirt is liberated from the cloth and is absorbed by the blotting paper underneath. Repeat the treatment to remove dirt from other soiled parts of the article. Examine to make sure that no soiled spot is left out.

Place the article to air for a day before finishing.

Cleansing with absorbent powders. Requirements for this method are a table covered with blanket and sheets, blotting paper, the absorbent powder and a small, soft brush.

This method, like the previous one, aims at cleaning only the very soiled parts of the article. Therefore, the article should be examined for such parts.

Method. Spread the blotting paper on the prepared table, and place the soiled part on the paper with the soiled side uppermost. Then spread the powder on that portion, rub it lightly and allow half an hour or so for the powder to absorb the grease and liberate the dirt. Repeat this on all soiled parts of the garment. Shake off the powder and brush the powdered parts thoroughly to remove all traces of powder, and with it the liberated dirt and the white colour of the powder.

Note. The whole process may have to be repeated, and even then it may not be very successful unless the garment is very slightly soiled.

Application of paste. Requirements for this method are the same as for the preceding one with the addition of one of the solvents.

Method. (*i*) Make a paste of any of the absorbent powders and a solvent. (*ii*) Spread the soiled parts of the article on blotting paper as described in the preceding method. (*iii*) Apply the paste on the soiled portion and leave it for half an hour or more. (*iv*) Scrap off the paste, brush the portion thoroughly. (*v*) Air the garment well before ironing.

Note. This method also, like the preceding one, is applicable to the cleansing of the article in parts.

21

Dyeing

Dyeing was practised in India from very early ages. Indigo is an important dye which was used in this country for colouring long before the Christian era. It is believed that the art of dyeing green, yellow and black was carried from India to Greece by Alexander the Great. History tells us that long before the textile industry was born and before man started weaving clothes, he used colours to decorate his body.

The dye stuffs used in early days were all from natural sources. These are known as natural dyes or indigenous dyes. These dyes are divided into three classes according to their source as (*i*) vegetable, (*iii*) animal, and (*ii*) mineral dyes.

Vegetable dyes. These are extracted from leaves, bark, pods, flowers or fruits of some trees. India has a number of sources of vegetable dyes.

Animal dyes. Examples of these dyes are *Cochineal* and *Tyrian Purple.*

Cochineal. This colouring matter consists of dried bodies of the female insects cocus cacti which lives on a species of cactus. These insects and plants are natives of Mexico and therefore cochineal was first known in Mexico. These insects were first brought by Captain Nelson to Bengal and South India and now cochineal is produced in the country itself.

Tyrian Purple is derived from a type of a shellfish found in the Mediterranean Sea. This is a very expensive dye as thousands of these tiny animals are required to obtain as much as one gram of the colouring matter. This dye was used for

the ruling families in the Roman Empire.

Mineral dyes. An example of this group is the "Iron Buff". It was first made by placing scraps of iron in a barrel, covering them with vinegar and water, and allowing the mixture to stand. The material was soaked in this mixture and then in a solution of wood ash, after which it was exposed to air when it developed the beautiful yellowish brown shade called the 'iron buff'. Now iron buff is produced by a number of methods, and each method gives different shades varying from light yellowish brown to a deep reddish brown or rust.

Synthetic dyes. The first dye stuff from chemical sources was discovered William Henry Perkin, an English chemist, in 1856. While he was attempting to prepare quinine from aniline, he accidentally discovered a method for preparing synthetic dyes. The first dye stuff, he discovered was Mauve, known as Perkin's Mauve.

Aniline is the basic substance from which practically most of the other dyes are synthetically manufactured. Aniline itself is obtained from one of the bye-products of coal-tar. The colours produced under this group are known as aniline dyes because of their origin, though in reality only a few of these are derived from aniline, and a large number of dye stuffs are made from compounds such as benzene, naphthalene and phenols.

The development of science led to the production of many more synthetic dyes from various organic and inorganic compounds. Germany produced the best dyes which were fast and the secret of preparing fast colours was unknown to the other countries till after the first World War.

The synthetic dyes are grouped either according to (*i*) the chemical nature of the dye stuff or (*ii*) the way in which the dye is applied to the cloth.

The following is the list of the dyes available in the market :—

(*i*) Acid dyes. (*ii*) Basic dyes. (*iii*) Direct or substantive dyes. (*iv*) Sulphur dyes. (*v*) Vat dyes. (*vi*) Mordant colours. (*vii*) Developed colours.

Acid dyes. These are sodium and calcium salts of coloured organic acids. They are acid in character and so, unsuitable for cottons. They are mostly used for dyeing silk and wool. On wool, the acid dyes give a better result. These are used in an acid and not in an alkaline medium for colouring silk and wool.

The silk and wool being animal fabrics are proteinous in nature. The basic molecules of the protein in them combine with the acid in the dye to form a colour compound.

Basic dyes. These are salts of organic colour bases and belong to the group of aniline dyes. They can be used direct for silk and wool, but in the case of cotton, some acid mordant has to be used. Generally, tannic acid is used as the mordant. Basic dyes give brilliancy and depth of colour to silks and to weighted silks particularly. Basic dyes are not quite satisfactory as they are not fast to light or washing.

Direct or substantive dyes. These can be applied to animal as well as to vegetable fabrics, but are generally applied to cottons and are known as direct cotton dyes. They are chiefly composed of amines and phenols and are soluble in water. A further treatment, therefore, with acetic acid and sodium dichromate is necessary to make them fast to washing. These colours are rather dull and so are usually topped with basic colours to give brilliancy.

Sulphur dyes. These colours contain sulphur and are soluble in sodium sulphite and other alkaline reducing agents. These dyes are applied to the fabric in a fairly strong alkaline bath. This continues their use to dye the vegetable fabrics only. It is therefore impossible to use them on silk and wool, unless a protective colloid such as glue is added to the dye bath.

Most of the sulphur colours are fast. Sulphur black is the fastest colour, but it is rather undesirable because the sulphur in the dye oxidizes to form sulphuric acid which weakens and may destroy the fabric.

Vat dyes are the dye stuffs belonging to a group of soluble compounds. The name originated from the old indigo dyes which had to be steeped in a bath to make them soluble. These dyes are made soluble by reducing them in an alkaline hydrosulphate bath. These dyes are very fast and are applied both to vegetable as well as animal fabrics.

Mordant colours. This is a group of coal tar colours. These are applied to fabrics with a metallic mordant. A mordant is an acidic or basic substance which helps a thorough penetration of the colour into fabrics. The fabrics are first treated with the mordant and then the dyes are applied to them. These dyes are used for wool and printed cottons to give a fast colour.

Developed colours. These dye stuffs require a treatment of a chemical which develops the colour. The colour is first applied to the fabrics which are then treated with certain chemicals called developers. The depth of the colour and the shade and fastness is changed when the dyed fabric undergoes the treatment with developers.

Method of home dyeing. The success of home dyeing depends on a clear understanding of the nature of the dyestuff, its affinity to and its reaction on the fabric. One should also know what process to follow in the application of the dyestuff in order to get a satisfactory result without doing any harm to the fabric.

The aim in dyeing new materials is to bring variety in colours in the fabrics. A thrifty housewife has a further aim and that is to renovate old articles by colouring them with new shades. Sometimes, some materials after washing get faded and need retouching to obtain depth of colour in order to make the cloth wearable. So a housewife is not satisfied with the knowledge of dyeing white materials only but also likes to know how to change the colours of her saris and make them look new. She is also anxious to make the faded articles look new and fresh.

It is not possible here to give exact and exhaustive instructions because of the confusing variety in dyes as well as in fabrics in modern times. So a few general principles are given to guide a housewife in carrying out the process of dyeing successfully.

Preparation for dyeing includes (*i*) selection of the dyestuff (*ii*) consideration of the fabric, (*iii*) the process to be employed and the equipment required to carry it out.

Selection of Dyes. It is much easier for a housewife to work with commercial dyes rather than with indigenous ones. The commercial dyes are usually labelled with instructions about the application and the kinds of fabrics they are suitable for. The departments of Industries in some parts of India have made experiments with indigenous substances and have published pamphlets on indigenous dyes and their application. But the methods to be employed are quite elaborate and the dyes are not always easily available. So the housewife has to pick and choose from the easily available substances which need less laborious processes.

It is better for a housewife therefore to examine the label of the dyes to find out the group it belongs to and to read the

instructions before selecting the dyes suitable for her requirement.

Questions to be considered about the fabric and its affinity to the dyes. Is the material new or old, coloured or white? Then which kind of fabric, vegetable, synthetic or mixed? In the case of mordant colours what would be the reaction of the fabric, to the chemical or mordants?

Preparation of the article. Buttons, ribbons, cords and if practicable even the lining should be removed. Pleats and gathers should be opened out, as it is difficult to get a satisfactory even colour with the pleats and gathers.

If the article is already coloured, it should be bleached before it is re-dyed to avoid the formation of patches and also to ensure the desired shade.

As the article has to be free from grease and stains and thoroughly clean, it should be washed but not dried.

Equipment. A dye bath, a small bowl, water (hot or cold as required), a wooden spoon, a piece of muslin, tubs for rinsing (fire, if necessary) and of course the dye and some chemicals to be used as mordants.

PREPARATION OF THE DYE BATH

1. The bath should not be of metal so that there is no reaction of the chemicals in the dyes on the metal. For household dyeing enamelled baths are quite satisfactory.

2. The bath should be big enough to hold the cloth and the dye solution.

3. The instruction on the dye packets should be carefully followed. To prepare the solution, it is best to tie the dye powder loosely in an improvised bag of muslin, and then shake the bag in cold or hot water according to the instructions, until all the powder is dissolved. Then put away the bag. The proportion of water and dye should be according to the instructions. The colour should be tested on tiny portions of the material to be dyed for the correct shade of the colour which should be twice as deep as the required shade of the dried material to allow for its getting light in the process of rinsing and of drying.

4. The articles to be dyed should be clean.

Process of dyeing. Before preparing the dye-bath it is advisable to test the colour on the fabrics. Make a little solution in a small bowl or beaker and dye a small piece of the material,

(the same material if possible, or a material of the same type) and note its effect. This test is a safeguard and acts as a guide to satisfactory dyeing.

Method of dyeing. Stir the solution in the dye-bath well before immersing the article in it. The article must be wet throughout and not dry before immersion. Open out and immerse the article in the prepared dye-bath. The solution in the dye-bath should be more than enough for the complete immersion of the article. This is very important as insufficient water will cause streaks and patches. Keep the article in the dye bath for as long as stated in the directions. The article must be stirred so that the dye in the solution does not settle down in patches and strips. Boil the article in the solution as directed.

Rinsing. Quickly rinse the dyed article in two or three waters until the water of the last rinse is clear. Addition of a suitable mordant to the first rinse will help to fix the colour. Ironing is not advisable but the moisture must be squeezed out of the cloth.

Drying. Outdoor quick drying in a shady place is necessary. Two people should hold the article at each end and move it up and down till the excess moisture dries up, and then the article could be put on a line to dry. If hung on a line when wet, there is a risk of getting an uneven shade or the formation of patches.

Note. The article should not have any folds or gathers during the whole process of dyeing, rinsing or drying.

Finishing. Precautions should be taken against a possible running of colour or its fading or the changing of its shade during the process of ironing.

1. The ironing table or skirt-board should be covered with an old sheet as a protection against stain if the colour runs.

2. Iron some tiny portion first to see the effect of heat on the colour, for adjusting the temperature of the iron.

3. Re-damping may cause spots, so it is better to leave sufficient moisture in the cloth when drying. If the cloth gets dry too soon, iron the article with a damp muslin spread on it but do not sprinkle water over it.

4. As a precaution the article should be ironed on the wrong side the first time.

22

Choice and Care of Fabrics

In our world there is no place now where man can live away from fabrics. They clothe him, protect him, decorate him, and provide him many hours of enjoyment. They cover the furniture, the floors, the windows of his home. They are found in his kitchens, bath-rooms, bed-rooms and living rooms. In brief these days fabrics have uses unknown before.

Since all of us come into contact with textiles many times in our daily lives, each of us can gain from knowledge of textile fibers and fabrics and their uses. If the prospective consumer knows something about the textile he wishes to purchase he can save himself a good deal of worry later

All early fibers were composed of natural plant or animal life. Wool, flax, cotton and silk were most important and used most frequently. For centuries man was dependent upon the sources and forces of nature for these fibers. Early in this century the first man made fiber rayon, became a practical reality, followed in 1920s by Cellulose Acetate. Since then scientists have produced dozens of new fibers. In fact the development of fibers, fabrics, finishes and other textile making techniques have made greater advances since 1900 than in the last five thousand years of man's recorded history.

All the synthetic fibers now produced have various qualities but as yet no one synthetic fiber duplicates the properties of natural fibers. All man made fibers are less absorbent and more resistant to most chemical action than the natural fibers. They are also harder to dye and less soft and

grateful to the touch, easier to launder, quicker to dry, more wrinkle-resistant and impervious to moths and other destructive agents. Alone and more importantly in combination with natural fibers the "Synthetlics" have introduced a remarkable range of new properties into fabrics. It is now possible from man's new knowledge of the chemistry of these fibers to introduce any property in a fabric at will. Fibers have now been produced which are water, crease, and fire resistant. Thus a person in modern times is most happily placed. In is now for him to say the purpose for which he wants the fabric and it is there. The choice now is practically limitless.

General properties of fibers. We discuss below the textiles fibers that are generally used for making, wearing apparel. There is no ideal fiber. a good fiber should possess as many of the characteristics mentioned below as possible :—

1. Appearence, 2. Feel, 3. Comfort, 4. Elasticity, 5. Ability to launder and dry quickly, 6. Power of absorption. 7. Durability 8. Affinity to dyes. 9. Fire, Wrinkle and water resistant. 10. Impervious to moths and mildew. 11. Should not shrink and lastly 12. Cheapness.

These are some of the most important qualities that a fabric should possess and a textile to be good must possess as many of these characteristics as possible. The qualities of some of the best known fabrics are discussed below :—

Cotton. Cotton is grown abundantly in our country and this fiber has been known to man for centuries. Its qualities are well known to every house-wife. It still holds sway over all other fabrics because of its cheapness good absorbent powers and appearence. It dyes easily, does not flame up quickly and is easily available. It can also be laundered and pressed quickly. It is not wrinkle-proof or easy to dry. With time cotton deteriorates and gives a creamy colour which is difficult to wash. Because of its cheapness cotton fabric surfaces are now given a special treatment which makes it more durable and water resistant. It is not affected by moths or mildew.

Silk. Silk has an organic origin and still retains its high place amongst fabrics. No fabric has such a good appearence or feel as silk, nor that natural deep lustre. It has a pleasant swishing sound which is very pleasing to ears. It can be worn through out the year. It can be easily tailored, laundered

dry-cleaned and ironed and dyed to different colours. Like cotton when brought near a flame it slowly sizzles up giving a peculiar odour. It is not a good absorbent nor crease and water resistant or impervious to attacks of moths or mildew. As silk threads are available in more than 300 colours so garments can be made out of this of any colour and matched with any dress. It gives one a regal look that is why in spite of a limited budget one is tempted to buy this fabric.

Wool. It is animal in origin like silk. It is not an all weather fabric and only used in winter months, thus garments made out of this fabric lie tucked up in boxes half the year unless you live in the very north of India. It is said that while silk has an aristocratic appearence wool has a utility look. It has a rough feel, high durability and elasticity. It absorbs moisture to a considerable extent but does not give the feeling that it has. It dries slowly and is to a large extent wrinkle resistant. Compared with silk and cotton it is very durable. It is difficult to launder as it wrinkles and shrinks As it shrinks it is usual to have it dry-cleaned. If brought near a flame it burns gradually giving a very penetrating smell. It is largely used to keep one warm. Clothes made out of this material last very long. It is apt to be affected by moths and mildew.

Synthetics. This class of fabrics have come hardly thirty years ago except rayon or cellulose acetate fabrics. They do not exactly match the qualities of cotton silk or wool, yet they have a mixture of properties of all these and many others that even natural fibers do not possess. Hundreds of these "Synthetics" are now known and they possess varying properties, but we will discuss here the qualities of "Nylon" the best known amongst, them, others have similar properties varying only in degree. Nylon has good appearence and feel. It has elasticity, is resistant to moisture and impervious to moths and mildew. It is very durable and easy to launder and dry. This material has therefore made it possible for people to travel with very few clothes. It cannot be easily dyed nor one feels very comfortable in it because of its impermeability and lack of absorbent powers. Improvement is being made in this direction. Fabrics are now made in which Nylon threads are mixed with cotton. Nylon does not shrink. In winter shirts blouses and saris made out of this material keeps one warm. We have briefly discussed the properties of various fabrics. The choice now is yours.

Care of Fabrics. The clothes we wear and use come in contact with various things daily which are not all visible to us. But an estimate can be made when we clean a room. Where does all this dust come from ? If one is out of the home his or her clothes come in contact with articles of various other material that keep flying in a busy city life. In big cities where thousands of car ply and there are big factories and electric power houses, soot and grease become important problems. The action of these particles has a very deteriorating effect on clothes. One has to be very careful about ones clothes if one wishes to have a neat appearence.

In our country, we do not have one kind of weather hence storing of clothes becomes a necessity. As mentioned before we must first see before we pack that our clothes are dry and properly brushed. Pockets and turned up ends of trousers must be examined and freed from dust grit soot etc. Then they should be well shaken brushed, ironed and carefully folded. If they are woollen it is better that they are dry-cleaned before they are packed, as the smell of the solvent used for dry cleaning keeps the destructive insects away. Formerly when insecticides were not known dried "neem" leaves or moth ball were used. They are even used now but modern insecticides are much more effective. It is still better if after folding your clothes you pack them in polythene bags and then seal the ends by passing it rapidly through a candle flame.

After folding it is necessary that the box in which you pack is clean, dry, and insect free. The clothes are then tightly packed in them and the box kept in a cool dry place and away from source of dust.

The storing of rugs, carpets and woollen fabrics is also a problem. These should be first carefully brushed and sprayed with a mild insecticide and then rolled. Powdered tobacco leaves are also said to be very good for woollen carpets. A number of insect repellants are now in the market which give good results. These hints we are sure will help a good deal to save your fabrics from moths and various other insects which are so destructive to fabrics.

wrap the clothes in newspapers as the printer's ink in it repels the insects.

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